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ABSTRACT

The purpose of this study was to collect baseline information about public knowledge of and opinions toward the Great Lakes and to measure the impact of a television news program in educating adults about the Great Lakes. Survey questionnaires containing multiple-choice knowledge items and Likert scale opinion statements were completed by 570 shoppers in two Cleveland, Ohio shopping malls to determine the current levels of knowledge and the opinions held. This baseline data revealed that knowledge levels about the Great Lakes are generally low while opinions about the lakes are generally environmentally positive. Following the survey, survey questions and the correct answers were broadcast on a local television news program accompanied by explanatory video segments. Another sample of 461 Clevelanders was surveyed following the broadcast at county and city library branches. For both library and mall respondents, environmental knowledge level and environmental opinion were positively correlated and were most strongly associated with educational level. A comparison of knowledge scores on questions that had and had not been broadcast for library respondents who had watched the television broadcast showed that the news program was effective in increasing knowledge levels among those who viewed it. An introduction, literature review, research methods, and results are included. Appendices include: lists of references used in preparation of surveys; questionnaires and survey forms; broadcast questions; an activity and game entitled "The Lake Next Door," and "Dick Goddard's Lake Erie Guide & Game"; and a summary of survey results by question. (Author/CW)

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The Impact of Television on Public Environmental Knowledge Concerning the Great Lakes

A Thesis

presented in Partial Fulfillment of the Requirements for
the degree of Master of Science in Natural Resources in the
Graduate School of The Ohio State University

by

Christine C. Brothers
The Ohio State University

1990

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To My Mother, Christine Morton Brothers

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Thesis Abstract

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Title of Thesis: The Impact of Television on Public Environmental Knowledge Concerning the Great Lakes

The purpose of this study was to collect baseline information about public knowledge of and opinions toward the Great Lakes and to measure the impact of a television news program in educating adults about the Great Lakes. Survey questionnaires containing multiple choice knowledge items and Likert scale opinion statements were completed by 570 shoppers in two Cleveland, Ohio, shopping malls during April, 1989, to determine the current levels of knowledge and the opinions held. This baseline study revealed that knowledge levels about the Great Lakes are generally low while opinions held about the Lakes are generally environmentally positive. In May, 1989, WJW-TV8 in Cleveland broadcast selected questions from the survey, the correct answers, and accompanying explanatory video segments on the station's evening television news program. Following the broadcast, 461 Clevelanders completed the entire survey questionnaire, which was provided at county and city library branches. For both mall and library respondents, environmental knowledge level and environmental opinion were positively correlated and were most strongly associated with education level. Respondents who cited newspapers or lake experiences as their primary source of Great Lakes information were more knowledgeable than those who cited television, however, environmental opinion did not differ by media use. A comparison of knowledge scores on questions that had and had not been broadcast for library respondents who had watched the television broadcast showed that the news program was indeed effective in increasing knowledge levels among those who viewed it. To the extent that the television news show viewership is representative of the general public, it seems that this media format can be an effective way to educate the public about the Great Lakes.

Rosanne W. Fortner

Adviser's Signature

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CHAPTER I

Introduction

This research was designed to enhance knowledge about the Great Lakes in a television audience by broadcasting questions and answers from a survey of Great Lakes knowledge followed by video segments explaining and expanding upon each question. As a result of the broadcast, the public received important information about the most salient environmental issues currently affecting the Great Lakes. A pilot study prior to the broadcast provided baseline information about adults' knowledge of and opinions toward the Great Lakes, and a survey administered after the broadcast measured the educational impact of a television news show in educating adults about the Great Lakes.

Need for the Study

Lake Erie, one of the five Great Lakes, is a statewide resource and an asset to the entire state of Ohio. Each day over 11 million people get their drinking water from Lake Erie. The lake generates billions of dollars in economic revenues to the state. It is used for recreation, power production, transportation, and manufacturing, provides habitat for wildlife, moderates the state's climate, is the source of many minerals, coal, and other valuable resources, and has influenced the settlement and development of Ohio.

Yet statewide tests of what Ohio students know about the Great Lakes administered in 1979 and in 1983 indicate that knowledge levels are low. Of the 3377 ninth graders tested, 40% could not identify Lake Erie on a map of the Great Lakes. Ninth graders in 1983 did not know what PCBs are (34% correct), what eutrophication means (31%), or what types of goods are carried on Great Lakes ships (21%). In both years, scores of 5th graders and 9th graders were approximately 38% and 48%, respectively (Fortner and Mayer, 1988).

The idea for this study arose in discussion of the student survey data between The Ohio Sea Grant Education Office and the Education Task Force of the Ohio Coastal Resource Management Program (OCRMP). It was noted that while ignorance of the consequences of actions, such as building too close to the shore or using excessive amounts of fertilizers, is suspected as a contributor to environmental degradation, no studies have been done to determine if indeed the public is ignorant of basic environmental concepts about the Great Lakes, and about Lake Erie in particular. Thus, the educational goals and efforts of OCRMP and other public education groups are based on a perceived but undocumented need for such education. This study was designed to provide baseline information about the level of adults' knowledge of the resources of and issues facing the Great Lakes, and, therefore, to provide evidence for the need, or lack thereof, for adult education about the Great Lakes.

The International Joint Commission, the U.S.-Canadian organization charged with overseeing use of the Great Lakes, has stated "polls and surveys on environmental matters can further the understanding of public perception of problems, solutions, priorities, and risks" (Great Lakes Science Advisory Board, 1987, p. 28). The IJC has suggested using measures of public opinions toward the lakes along with other more physical measures in evaluating ecosystem health. This study provided such information concerning public opinions toward and perceptions of the Great Lakes, with an emphasis on Lake Erie.

Statement of Problem

The mass media have had a significant role in the development of public environmental knowledge and attitudes. This is also true regarding public opinion about Lake Erie and the Great Lakes (Fortner, 1988). The agenda-setting function of the media is a well documented attribute. Mass media can determine which issues the public is thinking about at a given period (Grunig, 1987; Baily, 1971; Mazur, 1981; McLeod, 1987; Atwater, et. al., 1985). They can also create situations in which people will seek further information about a topic (Sandman, 1982).

Television can be used for influencing environmental attitudes among adults and for increasing their environmental knowledge (Fortner and Lyon, 1985). When asked to

cite their source of environmental knowledge, people often cite television as the major or a primary source (Murch, 1971; Perkes, 1973; Bohl, 1976; Fortner and Teates, 1980).

This study used the principles of cognitive dissonance through a question and answer format in a televised news program to enhance the environmental knowledge level of a television audience. The study measured the educational impact of such a television news program as a tool for educating adults about Lake Erie. Baseline information about the public's knowledge of and opinions toward Lake Erie was also collected to determine the present knowledge levels and the opinions held.

Objectives

Based on the stated problem and the need for the study, the objectives of this research were to:

1) determine what an adult sector of the public knows about the resources of and issues facing the Great Lakes;

2) determine what opinions toward the Great Lakes are held by an adult sector of the public;

3) identify demographic characteristics related to public knowledge of and opinions toward the Great Lakes; and

4) determine what impact a television news show can have on public knowledge of the Great Lakes.

Plan of Research

This research was part of a public education project, "Using Television to Enhance Public Information Levels about the Great Lakes," funded through a grant from the George Gund Foundation in Cleveland, Ohio. Principal investigators on the project were Rosanne W. Fortner and Victor J. Mayer. Project participants included the George Gund Foundation, WJW-TV8 in Cleveland, the Randall Park and Arcade Malls in Cleveland, the Cuyahoga County and City of Cleveland libraries, and The Ohio State University, Columbus, Ohio. Project components included:

1) Identification of environmental and natural resource issues facing the Great Lakes, accomplished through examination and review of planning literature from Great Lakes organizations and agencies to establish a Great Lakes Issues List;

2) Development of a survey questionnaire, the Great Lakes Survey, based on the Issues List to assess public knowledge levels about the Great Lakes and attitudes and beliefs held about the Lakes;

3) Panel reviews of the survey instrument to establish content validity, field testing of the survey to establish suitability and appropriateness of the instrument for a public audience, and testing of the survey with an informed group to establish reliability;

4) Administration of the survey at the Randall Park and Arcade shopping malls to establish baseline data concerning public knowledge of and opinions about the Great Lakes, these data also being provided to WJW-TV8 for use in its broadcast;

5) Broadcast by WJW-TV8 of selected multiple choice knowledge items and answers from the Great Lakes Survey on the weather portion of the evening news followed by video segments further describing the environmental issue or resource;

6) Development of a Lake Erie Guide and Game to serve as an incentive for respondents' participation in the library survey and a Lake Erie Fact sheet to provide respondents with answers to the questionnaire, both also serving to further educate the public about the Great Lakes;

7) Administration of the survey at the Cuyahoga County and City of Cleveland libraries following the televised broadcast in order to assess the broadcast's impact on public knowledge levels about the Great Lakes;

8) Demographic comparison of library respondents, mall respondents, WJW-TV8 viewers, and Cuyahoga County residents to establish representativeness of the sample populations and generalizability of findings;

9) Analysis of data and reporting of research findings through this thesis, presentation at the 1989 annual conference of the North American Association for Environmental Education, distribution of a "What's Your Great Lakes IQ?" fact sheet published by the School of Natural Resources, The Ohio State University, final report to the George Gund Foundation, and other appropriate methods.

Definition of Terms

Terms that are key to an understanding of the concepts of this study include:

Environmental knowledge: Environmental knowledge is "the factual information that individuals have about the environment, the ecology of the planet, and the influence of human actions on the environment/ecology" (Arcury and Johnson,1987, p. 32). The operational definition of environmental knowledge in this study is score obtained on the multiple choice section of the Great Lakes Survey questionnaire developed to measure public knowledge about the Great Lakes.

Environmental opinion: Environmental opinion consists of the respondent's attitudes and beliefs toward the environment. Attitudes are statements of how people feel about something while beliefs are assessments of what the respondent thinks is true or false (Dillman, 1978). Attitudes are evaluative. Respondents indicate whether they have positive or negative feelings about something. Beliefs have no implied goodness or badness and often no correct answer. Questions about respondents' beliefs may sometimes test knowledge of specific facts. In this study, environmental opinion is operationally defined as responses to attitude and belief statements provided on the Likert-type scale section of the Great Lakes Survey questionnaire.

Mall Test: The mall test is the baseline study of Clevelanders' knowledge of and opinions toward the Great Lakes as assessed by the Great Lakes Survey questionnaire administered at The Arcade and Randall Park Malls prior to the WJW-TV8 broadcast. Mall respondents are all those respondents who completed the Great Lakes Survey questionnaire at one of the two shopping malls.

Library Test: The library test is the post-broadcast assessment of Clevelanders' knowledge of and opinions toward the Great Lakes as measured by the Great Lakes Survey administered at Cleveland City and Cuyahoga County Libraries. Library respondents are all those respondents who completed the Great Lakes Survey questionnaire at either a city or county library branch.

Broadcast Items: Broadcast items consist of those questions from the multiple choice knowledge test of the Great Lakes Survey questionnaire which were broadcast during the WJW-TV8 Great Lakes Survey.

Nonbroadcast Items: Nonbroadcast items consist of those questions from the multiple choice knowledge test of the Great Lakes Survey questionnaire which were not broadcast during the WJW-TV8 Great Lakes Survey.

Week 1 Respondents: Library respondents who completed the survey during the week in which the televised broadcast occurred, May 22 to May 27, 1989.

Week 2 Respondents: Library respondents who completed the survey the week following the televised broadcast, May 28 to June 3, 1989.

Cognitive Dissonance: The American Association for the Advancement of Science in its Project 2061 report on scientific literacy has described the process of cognitive dissonance as follows: "People are inclined to respond to, or seek, information that supports the ideas they already have and on the other hand to overlook or ignore information that is inconsistent with the ideas. If the conflicting information is not overlooked or ignored, it may provoke a reorganization of thinking that makes sense of new information, as well as of all previous information. Successive reorganizations of one part or another of people's ideas usually result from being confronted by new information or circumstances. Such reorganization is essential to the process of human maturation and continues throughout life" (AAAS, 1989, p. 71).

Limitations and Assumptions

The limitations of this study arise through the sampling procedures imposed upon it by two of the objectives of the public education component of the project. Those objectives were to involve business in support of public education about the Great Lakes and to provide the public with further opportunities and resources to learn about the Great Lakes through the use of libraries. For these reasons, the surveys were administered at two area shopping malls and in the county and city libraries. This resulted in a systematic sample at the mall consisting only of those people who chose to participate. The library respondents self-selected to participate in the survey, either after viewing the broadcast, or as a result of posters announcing the survey at the libraries. Demographic characteristics of the sample populations will be compared to the target population, residents of Cleveland, to assess the representativeness of the samples and the generalizability of the findings.

CHAPTER II

Related Literature

Environmental education has been defined as "the process of developing a citizenry that is knowledgeable of the interrelated biophysical and sociocultural environments of which man is a part, aware of environmental problems and management alternatives of use in solving those problems, and motivated to work toward the development of diverse environments that are optimum for living" (Roth, 1970, p.65).

Authors in The Journal of Environmental Education frequently state the necessity of acquiring appropriate knowledge and attitudes as conditions of intelligent environmental policy making. "The pervasive model on which these statements are based appears to be, in its simplest form: increased knowledge leads to favorable attitudes toward pollution abatement which in turn lead to action promoting better environmental quality" (Ramsey and Rickson, 1976, p. 10).

This model of increased sallence to knowledge gain to attitude formation to behavior change, frequently used by environmental educators and communicators, is consistent with findings on the news media's effects on audiences in political and public affairs communications (McLeod, et. al., 1987). The agenda-setting function of media in determining what issues the public is thinking about in a given period is a well documented attribute (Grunig, 1987). This is true for environmental issues as well as for political ones.

Bailey (1971), noting that promotion of Earth Day had taken on many aspects of a political campaign, found that media coverage of Earth Day had raised the level of information about E-Day in the population over time. Mazur (1981) found public opposition to fluoridation and nuclear power as measured in public opinion polls increased and declined as media coverage of these issues increased or waned. For many decades, the mass

media have had a significant role in the development of public opinion about Lake Erie and the Great Lakes (Fortner, 1988).

Given the environmental education model of awareness-knowledge-attitude-behavior and the role of media in public attention to, information about, and opinions toward environmental issues, this literature review will examine what is known about the public's environmental knowledge, attitudes and behavior, the relationships of these attributes to each other, the correlates of environmental knowledge and attitudes, the public's use of mass media sources, and the role of mass media in environmental issues education.

Environmental Knowledge, Attitudes, and Behavior

What are the relationships between environmental knowledge, attitudes and behavior?

Needham (1975), investigating effects of student participation in a sea study laboratory, found conceptual knowledge and attitudes were strongly related. Fortner and Teates (1980) and Fortner and Mayer (1988) found high knowledge scores on tests of oceanic knowledge were accompanied by more positive attitudes about the oceans and other water environments. Fortner (1978) measuring marine knowledge and attitudes in Virginia students found a substantial positive linear relationship between marine knowledge and attitudes. Richmond (1976) as cited in Fortner (1985) reported strong positive relationships between higher environmental knowledge levels and positive attitudes.

Cohen (1973), in comparing high and low environmental knowledge groups of high school students, found the group with more environmental information had more positive attitudes than the group with less information and were also more willing to express their attitudes. He cautioned it may be impossible to clearly separate information and attitude as some attitudes have taken on aspects of information.

Burrus-Bammel (1978) evaluated a week long environmental education camp and found that attitudes were not correlated with knowledge even though both increased significantly from pretests to post-tests.

Bowman (1974) developed an instrument for assessing college student attitudes toward environmental decision-making based on agreement with statements concerning

environmental issues. A pre-test post-test control group design using 331 students at The Ohio State University showed that student attitudes changed significantly as a result of taking an introductory environmental management course. Because of its encompassing nature "environmental education may place certain restrictions on the number of attitudes it is feasible to assess on any one instrument" (Bowman, 1974).

Arbuthnot and Lingg (1975) compared the environmental knowledge, attitudes, and behavior of two samples of 56 French and 408 Americans, who were matched on social class, sex, age, and education. The relationship between environmental attitudes and knowledge was mixed for the two groups; both environmental attitudes and environmental knowledge were predictive of recycling behavior for Americans but not for French. These results suggested that "knowledge acts as a mediating variable between attitudes and behavior" (Arbuthnot and Lingg, 1975).

Ramsey and Rickson (1976) have suggested that not all knowledge leads automatically and quickly to favorable attitudes and behavior. Furthermore, "whether the attitudes lead to increased knowledge or the other way around is not clear, but probably the two variables interplay: elementary knowledge leads to attitudes which in turn motivate one to learn more and so on" (Ramsey and Rickson, 1976, p.11).

Constantini and Hanf (1972) studied environmental concern among community environmental decision makers in the Lake Tahoe Basin. They found a high association between the environmental concern scale and an environmental action scale.

Swan (1970) found junior and senior high school students in Michigan and Colorado were concerned about the environment and felt they contributed to pollution but were reluctant to take strong control measures or adopt ecologically sound behavior.

Dunlap and Van Liere (1978) have suggested the link between attitudes and behavior is often rather tenuous as the public may hold inconsistent or contradictory attitudes and ideas. Lounsbury and Tornatsky (1977), assessing three dimensions of environmental concern, found verbal commitment to environmental attitudes was higher than behavioral committment. The same was true among landscape architects, whose professional code champions environmental stewardship (Ruiz, 1987).

Maloney and Ward (1973), in a study of college, noncollege, and Sierra Club member groups, found that scales of environmental knowledge, verbal commitment to the

environment, and actual commitment were not related. They have suggested most persons have a relatively high degree of verbal commitment and affect toward the environment with lower levels of actual commitment and knowledge.

Members of environmental organizations such as the Sierra Club have been found to have stronger environmental attitudes and higher levels of environmental commitment than nonmembers (Maloney and Ward, 1973). Weigel (1977), studying proecology behavior in adults, found those who participated in ecological activities were more liberal in social, economic, and religious philosophies, were better educated, and had higher occupational status.

Arbuthnot (1977) studied community recycling center users and church members in Athens, Ohio. Recyclers scored nearly twice as many points on the knowledge scale as church members. Environmental knowledge scores were best predicted by the number of books read. The best predictors of environmental behavior as indicated by recycling center use were education and environmental knowledge.

Hamilton (1986) "explored relationships among the amount of knowledge people possess about environmental issues or problems, the extent to which they perceive those issues as important to them, and their feelings about who or what has control over factors affecting those issues or problems" (Hamilton, 1976, p. 15). Locus of control measured a respondent's internality or externality of feelings regarding causes and solutions to environmental problems. Environmental attitude, environmental knowledge, and importance were measured for 98 high school students, 82 college students, and 55 environmental educators. There were significant positive relationships between knowledge and locus of control, knowledge and perceived importance, and locus of control and perceived importance. Those who viewed a subject as important had more knowledge about it and greater internal feelings about their ability to affect change in that area. "Knowing about environmental issues and ecological principles will avail society nothing if no one believes that he or she can have any significant control over circumstances that might make a given situation better. If environmental education is to be effective, it must not only teach people about environmental problems and solutions, it must also help to convince people that their behavior can have a genuine impact in an expected and desired direction" (Hamilton, 1986, p. 29).

Public Environmental Knowledge

What does the public know about the environment, that is what is the public's environmental knowledge level?

"Although research to measure public attitudes, concern, and worldview toward the environment has been extensive, only a handful of studies have measured the public's knowledge about the environment" (Arcury and Johnson, 1987, p.31). "A further component of involvement in environmental issues seldom addressed in past research, but which is a natural extension of interest in environmental concern, is the individual's actual knowledge about the causes and consequences of environmental problems ....While concern about the environment and environmental problems is important for modifying individual behavior, public consensus, and public policy, this concern must be informed if the changes in behavior, consensus, and policy are to have the intended effect" (Arcury, et. al., 1987, p. 465). They suggest research on environmental knowledge can allow analysis of the variation in and causes and correspondence between knowledge, attitudes, and behavior.

A 1980 national survey conducted for the Council on Environmental Quality by Resources for the Future found 20% of the people sampled could answer 70% of the open-ended general environmental knowledge and energy knowledge questions correctly. The majority could answer only 3 of 9 questions (Arcury and Johnson, 1987). Arcury and Johnson (1987), used questions from the CEQ study as well as questions specific to the environment, water pollution and ground water in Kentucky in a statewide telephone survey of Kentucky residents. They found that the level of environmental knowledge in the state was roughly equivalent to that found in the CEQ study. Only 4.4% of those surveyed could answer at least 70% of questions on water pollution correctly and only 5.6% could answer 70% of the questions on groundwater contamination. They concluded that environmental knowledge of Kentuckians was poor.

Buethe and Smallwood (1987) compared scores of Indiana teachers on a survey of environmental knowledge to baseline scores of Indiana teachers' environmental literacy established on a similar survey in 1975. Overall mean scores of slightly less than 65% were found. Multiple choice test results showed improvements, and teachers in 1985 were more familiar with environmental terms, but many concepts and problems were

still not understood. The authors concluded teachers' environmental literacy was not optimal but appeared to have improved over the decade.

From their study of college, noncollege, and Sierra Club member groups, Maloney and Ward (1973, p. 585) conclude "despite its current popularity, the average person appears to know very little about ecology. Thus it becomes difficult to develop an ecological knowledge scale with many high-probability or 'easy' items." This may explain the low knowledge correlations found with some scales of environmental knowledge and attitudes.

Much of the research on environmental knowledge levels has been done on school students. Blum (1987) reviewed results from five studies conducted in four countries of students' knowledge and beliefs about the environment. In general, the level of achievement on the tests was low. Two of the studies concluded that "students' factual knowledge was deplorably lacking, but their environmental attitudes were higher" (Blum, 1987, p.10). Howe and Price (1976) as cited in Fortner and Wildman (1980) evaluated 10th and 12th graders in Ohio and found they had relatively little knowledge pertaining to marine education but expressed positive attitudes toward the water environment.

Brody and Koch (1986), using concept maps and interviews, studied the concepts held by 226 4th, 8th, and 11th graders from 12 schools in Maine concerning the Gulf of Maine as a marine ecosystem and a shared international resource. Mean interview scores for each principle identified at each grade level were all relatively low and students at each grade level understood only a few basic science and natural resource concepts. Students at all levels had virtually no understanding of the concept of nutrient, for example. Only relatively minor gains in knowledge and comprehension of marine related concepts occurred between 4th and 11th grade.

Brody, Chipman, and Marion (1989) used a similar concept map and interview approach to assess 175 4th, 8th, and 11th grade students from 18 Maine schools on their concepts related to acid deposition. Students understood only a small fraction of what was considered necessary for a full understanding of acid deposition.

Walter and Lien (1985) surveyed 3,890 students and 155 teachers from 121 schools across Canada to explore their marine knowledge, their attitudes and orientation toward oceans and marine resource issues, and their experience related to the oceans. Knowledge levels were low; seventy percent could not understand a basic marine food

chain. English students scored slightly higher than French ones, and students living 100 to 500 kilometers from the ocean higher than those more than 500 or within 100 kilometers respectively. Students generally felt positively about the oceans with those living closer to the ocean having a more utilitarian, less preservationist, view than inland students.

Fortner and Mayer (1983, 1988), as discussed earlier, found low knowledge levels about the Great Lakes among Ohio students in 1979 and 1983. Leek (1979) developed a Marine Environmental Awareness Test to assess impact of Project COAST curriculum materials and found in testing 4th, 8th, and 11th graders in fourteen states mean scores of 38% to 42%. Fortner (1978), in a Survey of Oceanic Attitudes and Knowledge (SOAK), measured knowledge, attitudes, and participation in marine-oriented activities. Tenth graders in thirty Virginia schools showed moderate levels of marine knowledge and 93% of the students indicated positive attitudes.

As cited in Arcury and Johnson (1987), Ramsey and Rickson (1976) and Arbuthnot (1977), compared environmental attitudes to a composite knowledge score but gave no actual knowledge level analysis. Perkes (1973), as cited in Alaimo and Doran (1980), assessed environmental knowledge and attitudes of 10th and 12th grade students in eleven states. Males did significantly better on factual items than did females.

Towler and Swan (1972) report the findings of a survey of elementary school students in Indiana and Florida. Students were aware of and concerned about environmental problems but were pessimistic about solving them. Students showed a lack of knowledge of factors affecting the environment and their personal involvement in environmental problems. Swan (1970), as cited in Towler and Swan (1972), found teachers knew more about the environment than their students but still had large knowledge gaps. Children reported their knowledge of pollution came from television and newspapers, not learning in school.

Correlates of Environmental Knowledge

What are the correlates of environmental knowledge?

Ramsey and Rickson (1976) studied environmental knowledge and attitudes in 482 high school seniors compared to the variables of residence, father's occupation, father's

education, mother's education, family income, and grades in school. None of these factors were associated with either knowledge or concern.

Baily (1971) found education was strongly related to knowledge of Earth Day and appeared to interact with age and occupational class. Political activism was a good predictor of information level. Sex was not related to information level. Baily suggested that while demographic differences in populations act as independent variables affecting communication patterns and levels of knowledge, the relative importance of each changes with the kind of information being studied.

Buethe's (1985) study of Indiana teachers found males and married teachers were more environmentally literate, but there was no significant difference by age or rural/urban location. Blum's (1987) review of student knowledge and attitudes in four countries found boys scored higher on knowledge test items, but there was no significant difference by sex on attitude items.

Arcury, et. al. (1987) found on a twelve item, self-reporting scale of environmental knowledge, that men were more knowledgeable about the causes and effects of acid rain. Age, education, and television news exposure were significantly associated with knowledge. Education had the greatest effect on knowledge with sex and age having an equivalent effect. Number of days per week respondents watched television news broadcasts had a small negative influence on environmental knowledge.

Arcury and Johnson (1987) in their study of Kentuckians' environmental knowledge, found education, income, and sex were the best predictors of environmental knowledge. Education had the strongest positive relationship and there was a positive association of income with knowledge which may have resulted from the typically direct relationship of education and income. Being female was negatively related to knowledge, and neither age nor metropolitan residence had a strong or consistent association with knowledge.

Fortner and Mayer (1983, 1988) and Fortner and Teates (1980) all found that sex, race, and proximity to water were related to students' oceanic knowledge. In general, whites, males, and coastal students had higher aquatic knowledge scores.

Public Environmental Opinion

What is the level of public concern about the environment?

The Societal Committee of the Great Lakes Science Advisory Board of the International Joint Commission (1987), in reviewing polls conducted over the last two decades on public knowledge and attitudes concerning environmental issues in general and the Great Lakes in particular, found that while public concern about the environment arose in the 1950's, it did not appear in national public opinion surveys as a topic until 1969. Since then, results of such opinion surveys have shown public concern remains consistent and strong.

However, much of the research on environmental concern and attitudes was conducted in the early 1970's when the environmental movement was at a peak (Buttel and Johnson, 1978). Honnold (1984), using National Opinion Research Center General Surveys from 1973 to 1980, found environmental concern declined in all age groups during that period. Honnold concluded this decline was a result of events occurring during the period 1973 to 1980 rather than a result of the aging process or of shared history of the age groups.

Dunlap and Dillman (1976) conducted a panel study of 3000 Washington state residents surveyed in 1970 and 1974 to assess changes in support for environmental protection as measured by preference for government spending. There was a significant drop in the number of respondents wanting more spending on pollution control and protection of forests and other areas for public enjoyment and an increase in those choosing less spending. Half the respondents gave spending on environmental protection a lower priority in 1974 than 1970 while only 5% gave it a higher priority. Lower priority for such spending was attributed to competition with other government spending programs and respondents' belief that much progress had been made in cleaning up the environment, not to maturation or attrition (Dunlap and Dillman, 1976; Dunlap, Van Liere, and Dillman, 1979).

Thompson and Gasteiger (1985) found significant changes in attitudinal responses to environmental, material, and energy resources occurred among Cornell University students between 1971 and 1981. Students self-rated their willingness to give up items

having an impact on life-style, use of resources, and environmental contamination. Preferences in 1985 favored materialistic considerations and more conservative approaches to environmental issues. Attitudes were negatively associated with family income as shown by higher income students being less willing to sacrifice certain items. Education did not play a major role in attitude responses, and there was no tendency for either males or females to be more concerned.

Correlates of Public Environmental Opinion

What are the correlates of public environmental opinion?

Most research on environmental concern and attitudes has focused on the variation in attitudes in order to understand the sociodemographic correlations of concern (Arcury and Johnson, 1987). Since 1969, responses to environmental public opinion polls have not varied significantly among demographic characteristics such as race, age, or sex, but concern was somewhat associated with income and most closely with education (Great Lakes Science Advisory Board, 1987).

De Groot (1967) found age, sex, race, and socioeconomic status were poor predictors of concern about air pollution. The overriding determinant of concern was atmospheric quality of the individual's environment.

National Wildlife Federation national polls in 1969 and 1970 found concern for environmental quality was directly related to formal education and income and inversely related to age (Tognacci, et. al., 1972). Studying environmental concern in residents in Boulder, Colorado, Tognacci, et. al. (1972, p. 83) concluded "the environmentally concerned individual tends to be more liberal in sociopolitical orientation, younger, and better-educated than persons who remain less concerned about ecological issues." Socioeconomic status was also thought to be associated with environmental concern.

Buttel and Flinn (1974), in three statewide surveys of environmental concern in Wisconsin, found education was a powerful predictor of environmental concern while the association between concern and income showed considerable change over time. There was no relation between concern and political party or rural-urban residence, except when the latter was separated into farm and nonfarm populations. Nonfarm populations were more concerned than farm populations. Leftridge and James (1980) found rural

high school students to be more perceptive of environmental problems than urban ones regardless of the issue or educational level of the students.

Honnold (1981) used data from the National Opinion Research Center's General Social Surveys of adults from 1973-1978 to examine predictors of public environmental concern. The importance of three variables, sex, race, and place of residence at age 16 indicated that childhood socialization experiences are probably influential in the development of pro-environmental attitudes. Income and education were the least predictive of concern. Younger adults, Democrats, and liberals were more concerned than others.

McTeer (1978) found teens have a greater concern for the environment than adults. McLeod, et. al. (1987) found those with higher social status attributed more importance to the energy issue, were more knowledgeable, had more favorable attitudes, and engaged in more conservation behavior.

Dunlap and Catton (1979) found that age, education, political ideology, and residence were the best predictors of concern for environmental quality. Buttel (1979) and Honnold (1981) demonstrated the importance of age as a predictor of environmental concern even controlling for residence, education, political ideology, income, education, sex, and occupation.

Caron (1989) used the New Environmental Paradigm scale developed by Dunlap and Van Liere (1978) to measure the environmental perspectives of 603 black urban residents in Virginia. The scale measures people's acceptance of the new environmental paradigm encompassing harmony, stewardship toward nature, limits to growth, and interrelatedness of humans with the environment in contrast to the dominant environmental paradigm which is anti-environment and exploitative, and emphasizes conquest of nature, devotion to private property, and faith in science and technology. Analysis revealed a strong similarity between Caron's sample and Dunlap and Van Liere's (1978) sample of predominantly white residents of Washington state. Scores indicated a moderate acceptance of the pro-environment NEP perspective with black's level of concern comparable to that of whites. Years of education and income were positively correlated with NEP scores, while age was negatively correlated.

Simon (1971) in a telephone survey of 345 people in Illinois, found those with more education were more likely to perceive population problems and to have opinions about

how to alleviate them than those with less education. The college-educated were less likely to support President Nixon's pollution policy than those with a grade school education, but political party preference made no difference in support.

Constantini and Hanf (1972) studied environmental concern among community environmental decision makers in the Lake Tahoe Basin. Those who scored high on the concern scale viewed environmental problems as more urgent, were less likely to feel problems had been overemphasized, or were in the process of being solved, and were more likely to attribute importance to the problem of environmental degradation. Education and concern were positively correlated; concern and income were slightly negatively correlated. The longer the duration of residence, the less likely respondents were to be highly concerned about the basin's environmental problems. The low concern group was more likely to hold conservative attitudes than the high concern group.

Buttel (1979) and Buttel and Flinn (1978b), in a 1974 statewide sample of 548 Wisconsin residents, used awareness of environmental problems and support for environmental reform as two measures of environmental concern. Awareness measured the extent to which people felt problems were serious; support for reform measured attitudes toward governmental regulation of private natural resource decision-making. Age was not the primary predictor of either scale, but it was the most consistent one. Age was moderately correlated with both scales and was more strongly associated with environmental concern than were education, income, or occupation. Income and occupation showed no major relationships. Of education, income, and occupation, education was the most highly associated with both attitude measures. Place of residence was the best predictor of awareness but had only a meager relation to support. Buttel concluded "the data of this study and related research findings solidly establish age - not education - as the major socioeconomic correlate of public environmental beliefs" (Buttel, 1979, p. 250).

Buttel and Flinn (1976, 1978a) used the same data to investigate the effects of political party and ideology on environmental attitudes. No major relationship between political party and either measure of environmental concern was found when age, education, and residence were controlled. Age and education were found to have substantial effects on support for environmental reform.

Dunlap (1975) in reviewing studies of political affiliation and environmental concern states "a careful examination of the evidence shows that in the relatively few studies which have examined political ideology (Constanti and Hanf, 1972; Dillman and Christenson, 1972; and Tognacci, et. al., 1972; and the present study), Liberals have always been found to be more pro-environmental than Conservatives. In contrast, the evidence concerning party preference is fairly evenly split between that which reports no Republican-Democratic differences (Buttel, 1972; Dillman and Christenson, 1972; Munton and Brady, 1970) and that which reports such differences (Constantini and Hanf, 1972; Dunlap and Gale, 1974; Tognacci et al., 1972; and the present study)" (Dunlap, 1975, p.449).

Tremblay and Dunlap (1978) compared results of studies of rural-urban residence and environmental concern. Studies at the state or national level reported negligible relationships between environmental concern and rural-urban residence while those at the local or community level generally reported substantial relationships with rural residents being less concerned than urban ones. Analyzing data from a Louis Harris and Associates, Inc. 1970 survey of environmental problems in Oregon, they found that fewer respondents viewed pollution as a serious problem in their community as compared to the state, rural residents were less concerned than urban ones, and differential levels of pollution concern were not accounted for by age, education, or income.

Studies examining differences in environmental concern between males and females have been limited and results have been inconclusive (Arcury, et. al., 1987). Girondi (1983) surveyed members of anti and pro nuclear special interest groups and the general public in Ohio and Kentucky and found that females and those who were not college educated appeared to be more antinuclear than males and college educated persons. McStay and Dunlap (1983) used a multi-item scale to measure seven dimensions of environmental concern. Being female was modestly positvely correlated with five of the scales but not with population control or public behavior. Brody (1984) and Passino and Lounsbury (1976) both found women were more concerned about nuclear power than men.

Arcury, et. al. (1987) used a statewide telephone survey of 516 adults in Kentucky to test differences in concern and knowledge about acid rain. They found no difference

between men and women in stated concern about acid rain, as measured on a Likert scale, or in relative concern about acid rain compared to other problems. Men showed greater active concern as indicated by whether they knew their senator's position on the issue or had contacted a public official. In the sample, 4.6% reported belonging to an environmental group. Family annual income was a modest predictor of stated concern and education of relative concern. Number of days per week respondents watched news programs on television had a weak negative influence on relative concern.

Tognacci, et. al. (1972:85), as cited in Buttel and Flinn (1978b), conclude "those persons most concerned with environmental issues appear to reflect the same configuration of social and psychological attributes which have traditionally characterized individuals active in civic, service, and political organizations" (Buttel and Flinn, 1978b, p. 434).

In a survey of 1200 Sierra Club members in 1969, Devall (1970) found that club members were upper-middle class as indicated by education, occupation, and income. Members were as active or more active than other college-educated people in a variety of voluntary organizations and also tended to be active in other conservation organizations (Devall, 1970).

Buttel and Flinn, studying environmental concern in Wisconsin, state "that members of environmental organizations are upper-middle class — well-educated, white-collared, and moderately affluent — is beyond doubt" (Buttel and Flinn,1978b, p. 435). They question if, given that environmental organization membership is class-biased, environmental beliefs are similarly structured. "Clearly there are different social processes involved in joining a voluntary environmental association than in the general public's becoming aware of and concerned about environmental problems" (Buttel and Flinn, 1978b).

Van Liere and Dunlap (1980) reviewed many studies of environmental concern. "Given the large number of studies . . . . one might expect that considerable progress has been made in identifying and explaining variation in public concern with environmental problems. Instead, one finds considerable dissensus with respect both to the evidence itself and its interpretation" (Van Liere and Dunlap, 1980, p. 182). Their review found the bulk of evidence supports the hypotheses that younger people tend to be more envi-

ronmentally concerned than older people. There was very weak support for the hypothesis that social class is positively associated with environmental concern. Such support rests primarily on the moderately strong relationship between education and concern with the characteristics of income and occupational prestige failing to support the social class hypothesis. Urban residents were more likely to be environmentally concerned than rural ones, however, this relationship may depend on the indicator of environmental concern being measured. Evidence for sex as a variable of environmental concern is meager and results are inconclusive but suggest that it is not substantially associated with environmental concern. In general, evidence supports the assertion that political party is not crucial in explaining variation in environmental concern. However, there was substantial support for liberals being more concerned than conservatives. Van Liere and Dunlap concluded "the limited utility of demographic variables in explaining variation in environmental concern points to the widespread distribution of such concern in our society. Although somewhat stronger among the young, well educated, and liberal segments of society, environmental concern is by no means restricted to persons with such characteristics" (Van Liere and Dunlap, 1980, p. 193).

Van Liere and Dunlap (1981) compared the consistency of results between several scales of environmental concern. They asked "do the various measures of environmental concern constitute parallel tests, or are they measuring different underlying concepts? In other words, does it make a difference how environmental concern is measured?" (Van Liere and Dunlap, 1981, p. 652). Studies of concern have differed in the substantive environmental issues addressed and in theoretical conceptualization, that is the way in which concern is expressed -- perceived seriousness of problems, support for government spending on environmental protection, knowledge of environmental issues and problems, support for reforms to protect environmental quality, and actual involvement in pro-environmental behaviors.

In reviewing studies examining the consistency of such measures, Van Liere and Dunlap found conflicting results in terms of intercorrelations among the concern measures and of correlations between the measures and demographic variables. They sampled 1441 households in Washington state in 1976 using a survey on which items systematically varied in substantive issue and theoretical conceptualization. They found correla-

tions among the six concern scales used and between the six concern scales and sociodemographic variables varied considerably. Political ideology and education were the strongest and most consistent correlates of concern followed by age and residence. Liberalism, education, and urbanism were positively correlated with concern while age was negatively correlated. Women were significantly more concerned than men on all but the population concern scale. They conclude that environmental concern may be a fairly broad concept best represented by respondents' concern about pollution and natural resources, that behavior is not necessarily consistent with respondents' cognitions, and that different types of concern measures are related to demographic characteristics in different ways.

Kuhn and Jackson (1989) used a modification of the "New Environmental Paradigm" scale developed by Dunlap and Van Liere in 1978 to collect data from residents of Edmonton and Calgary, Alberta, in 1984 and 1986 in order to profile the respondents' environmental orientation. The scale was found to be stable in measuring similar dimensions of environmental attitudes among the two samples. Factor analysis showed that environmental attitudes were multidimensional but focused on four areas — consequences of growth and technology, the quality of life, relationships between humans and the natural environment, and limits to the biosphere. Albrecht et. al. (1982) used the New Environmental Paradigm scale to measure attitudes among farm operators and city residents in Iowa. They found the scale to be multidimensional, measuring three distinct attitudinal domains ——balance of nature, limits to growth, and man over nature. Persons may fully endorese some elements of the paradigm but fail to accept others.

Mass Media as a Source of Environmental Information

What media do the public use as sources of environmental information?

In the 1979 Ohio study of student knowledge of and attitudes toward the oceans and Great Lakes, 28% of 5th graders and 37% of 9th graders perceived movies and television as the greatest influence on their environmental knowledge (Fortner and Mayer, 1983). Although these levels dropped by the 1983 study, television was still an important information source. This decline in the numbers citing television was attributed to a decline in the number of natural history programs being developed and aired on

television. Choice of information source was not significantly related to sex, race, or lake or inland region (Fortner and Mayer, 1988). "It is obvious that students regard entertainment media as the source of much of their knowledge about the world of water" (Fortner, 1983, p.9).

Walter and Lien's (1985) study of marine knowledge and attitudes among Canadian students found that knowledge scores were positively associated with reading educational magazines and with watching educational television programs. Thirty-one percent and thirty percent respectively cited school and television as their most important source of marine information. Those with the highest knowledge scores cited television and direct experiences with the sea as their primary information source.

Blum's (1987) review of five environmental knowledge studies in four countries found in the three countries surveyed for information source that mass media including radio, television, and press were identified as the most important source. Of 10th and 12th graders surveyed in 33 states in 1973 and 1976, 42% and 39% respectively identified television as their primary knowledge source (Perkes, 1973, and Bohl, 1976). Fortner and Teates (1980) found 39% of Virginia 10th graders selected television as their major environmental information source.

Richmond (1976), asked 11,000 students in England to identify their primary sources of environmental knowledge. Over 60% selected reading, radio, and television. Alaimo and Doran (1980), studying high school students' perceptions of the environment, found a generally high perception of television as a source of information for all grade levels, although perception of magazines and newspapers as an information source increased with increasing grade level.

Sixty-four percent of those surveyed by the fourteenth Annual Roper Survey on Public Attitudes Toward Television and other Media in 1985 stated television is where they usually get most of their news (SIPI, 1989). Murch (1971) surveyed public environmental opinion of Durham, North Carolina, residents and found 73% identified television as their major source of pollution information.

Wade and Schramm (1969), reporting results from six national surveys on public affairs, science, and health, concluded television was a more likely source of public affairs knowledge for people with little education, for females, for nonwhites, and for

farm and blue collar workers than for others. Print media were more likely the major source of such information for highly educated groups, whites, males, high income groups, and professional, managerial, and white collar workers. Newspapers were clearly preferred as a source of science news regardless of socioeconomic status.

Williams, et. al., (1977) found middle income whites used print media as their usual first information source, Mexican-Americans relied on agencies or institutions, while low income blacks used interpersonal networks. Williams and Lindsay (1978) compared communication habits of social workers, clients, and business leaders. All three groups rated television as the most trustworthy news source. Business leaders read newspapers more regularly than clients: clients watched the most television, leaders the least. There was no difference among the three groups in radio or magazine use. Media habits and attitudes were more a function of social stratification than of ethnic group.

Kent and Rush (1971) used personal interviews in Gainesville, Florida, to study how communication behavior of senior citizens affects their public affairs knowledge. Of those surveyed, 51% indicated television was the best way to keep up with the nation's problems, and 29% indicated newspapers. Public affairs knowledge was strongly influenced by education and income which were strongly related to each other. Holding age, sex, and income constant, education was the sole variable still related to public affairs knowledge. Exposure to print media (magazines, books, newspapers) was related to level of education while electronic media (movies, television, and radio) were independent of education. Exposure to print media rather than electronic media showed significant relationships with public affairs knowledge. They conclude "education is positively related to the use of print media which in turn is positively related to public affairs knowledge" (Kent and Rush, 1971, p. 45).

Baily (1971), asking people to recall where they first heard of Earth Day, found newspapers were cited by nearly 40% of respondents and that interpersonal sources (buttons, posters) were more frequently cited than broadcast media. He identified what he called the knowledge gap related to media usage and exposure. "When the media disseminate news or information about a public issue, the more educated segment of the audience is more likely to receive and assimilate that knowledge than the less educated

segment . . . . Ironically, public information campaigns in the mass media appear to widen that gap, as the educated become more informed by the campaign than do the uneducated" (Baily, 1971, p. 7).

Arbuthnot (1977), studying recyclers and church members, found that people who were more environmentally knowledgeable tended to have used more detailed information sources. Both groups reported newspaper use about equally, but recyclers more often reported use of national magazines. More recyclers than church members belonged to environmental groups. They conclude "the powerful role of education, when compared to the attitudinal and personality variables, would seem to indicate that educationally oriented information dissemination programs (particularly in the popular media) may be successful in gaining behavioral commitments" (Arbuthnot, 1977, p. 231).

Sellers and Jones (1973), in a telephone survey of Sierra Club members, found activists turn primarily to conservation groups for environmental information, not mass media. They suggested mass media do not provide the long-range, probing, in-depth information required by environmental activists.

Harry et. al. (1969), in a questionnaire mailed in 1966 to adult members of an outdoor activity/conservation association, separated the group into conservationists and nonconservationists. The conservationists were older, better educated, and held higher status occupations than the nonconservationists or general public. They also tended to specialize in the types of organizations they joined. Harry concluded "interest in some outdoor activity appears to be a prerequisite for eventual involvement in the conservation movement . . . . Then, association with others who share similar attitudes toward nature, together with political socialization into the mechanics of the conservation movement, may lead to further involvement such as affiliation with regional or national conservation organizations" (Harry, et. al., 1969, p. 249).

In a study of marine recreation users of Green Bay, Wisconsin, Ditton and Goodale (1974) found varying levels of understanding of the Bay's condition and differing levels of emotional reaction to the Bay among groups who swam in, fished, boated on, or did not use the Bay. Environmental forces and problems were not well understood but exposure to the resource in recreational and other activities seemed to facilitate understanding of the resource. They conclude "for most people water-based recreation may well be the

major, if not the only, source of experience with water resources. Thus, it seems likely that recreation participation and resource use patterns are related to perceptions and attitudes regarding the quality of water resources" (Ditton and Goodale, 1974, p. 21).

Mass Media's Role in Environmental Issues Education

What is the function of mass media in educating about the environment?

Fortner and Teates (1980) and Fortner and Mayer (1983) found a significant relationship between marine and aquatic knowledge and self-reported watching of Cousteau specials. However, it was unclear whether the programs generated the knowledge or whether the more knowledgeable students watched the specials because they were already interested.

Fortner (1985) tested the effectiveness of television in providing out-of-school instruction for ninth graders in a suburban Ohio high school. A pretest-posttest-delayed posttest comparison group design was used with three classes receiving classroom instruction on marine mammals, two classes watching a Cousteau documentary, "Mammals of the Deep: The Warm Blooded Sea," at home on television, and five classes receiving no instruction and not watching the documentary. Knowledge levels increased significantly for both treatment groups and remained higher than pretest levels on the delayed post test. Scores of the comparison group did not change significantly between tests. Attitudes of the television group shifted positively from pretest to posttest but regressed to pretest levels on the delayed posttest. The classroom instruction and comparison groups showed no attitude change. Fortner concluded "home viewing of a single environmental science documentary can result in increased and retainable knowledge and can temporarily alter attitudes among ninth graders" (Fortner, 1985, p. 124).

Fortner and Lyon (1985) used the same Cousteau documentary to test the effectiveness of television in communicating environmental information to the general public. A random sample of 1000 adult subscribers to QUBE cable television in Columbus, Ohio, was used to obtain two groups of 250 adults each, one group assigned to watch the documentary, and one to serve as a comparison group. The interactive nature of the cable system allowed selective "narrowcast" of the tests and tabulation of viewer responses. Posttest and retention test knowledge scores for the treatment group were significantly

higher than for the comparison group indicating that people can learn from an environmental documentary on television. The comparison group showed no attitude change, while the treatment group's attitudes showed a positive change on the posttest but regressed toward pretest levels on the retention test. Thus, viewing of the documentary produced temporary alterations of attitudes. Such small incremental changes in attitudes may eventually lead to new beliefs.

Given the low environmental knowledge levels often found in studies of environmental knowledge, providing more environmental information seems a reasonable way to begin to improve environmental attitudes and produce desired environmental behavior (Fortner and Lyon, 1985). "The ninth graders of 1983 are the voters of 1987 and beyond. If only 8% know that phosphates have been responsible for Lake Erie's historic water problems, it is unlikely that they are well prepared for making responsible decisions about the future of our water resources" (Fortner and Mayer, 1988, p. 109).

Novic and Sandman (1974, p. 451), studying how use of media affects views on solutions to environmental problems, found "respondents who made relatively heavy use of environmental information sources other than the mass media considered themselves more informed, judged the issues more serious, chose more personal solutions and showed a stronger relationship between information and personal commitment than respondents who were limited more closely to mass media information sources." They ask "what is the impact of mass media exposure on information-seeking behavior? When do the media stimulate interest, and when do they satiate it? Perhaps an important function of the mass media in emerging social issues is to develop the audience's knowledge and concern to the point where interpersonal contacts and more specialized media — with heavier emphasis on personal involvement — are sought out and utilized" (Novic and Sandman, 1974, p. 449).

Rubin, et. al. (1974), reviewing the field of environmental information, stated "assuming that a broad public literacy of biological and ecological concepts is at the heart of defining, reclaiming, and maintaining environmental quality, the press should strive to create an awareness of environmental problems, and then seek to develop an understanding of underlying principles, issues, and answers."

Dana (1969) has suggested that mass communications probably have more effect on the American mind than all the Nation's schools and universities combined, and that "properly used, they can be an outstanding means of educating the public as to the importance of the natural environment in the economy, social, and cultural life of the Nation" (Dana, 1969, p. 14).

Fred Jerome, Executive Vice President of the Scientist's Institute for Public Information, in a speech at the "Strategies for Change Conference" sponsored by the American Medical Association and the National Initiative for Science and Technology Education, said "It is arguable that all of the impressive proposals and all the impressive studies on how to improve science education in our schools are aimed at the wrong classroom. For the vast majority of the American public, the TV set is the only teacher. . . . The medium that more than any other molds the American consciousness is television. I'm talking about *commercial* television (SIPI, 1989, p. 9).

Summary

Environmental knowledge has generally been found to be positively correlated with environmental attitudes (Needham, 1975; Fortner 1978 and 1980; Fortner and Teates, 1980; Fortner and Mayer, 1983, 1988; Richmond, 1976; Cohen, 1973; Hamilton, 1976; Bowman, 1974; Arbuthnot and Lingg, 1975). The relationship between environmental attitudes and environmental behavior may be inconsistent or contradictory (Dunlap and Van Liere, 1978). Verbal commitment to the environment is often higher than behavioral commitment (Maloney and Ward, 1973; Swan, 1970; Ruiz, 1988; Lounsbury and Tornatsky, 1977). Knowledge may act as a mediating variable between attitudes and behavior (Arbuthnot and Lingg, 1975), and knowledge and attitudes may reinforce each other (Ramsey and Rickson, 1976).

Research on public environmental knowledge has been limited (Arcury, et. al., 1987; Arcury and Johnson, 1987). Environmental knowledge levels have generally been found to be low (Arcury and Johnson, 1987; Resources for the Future,1980; Buethe, 1985; Malony and Ward, 1973). Much of the research on environmental knowledge has been done on school students, and knowledge levels have been low (Blum, 1987; Howe and Price, 1976; Brody and Koch, 1986; Brody, et. al., 1989; Leek, 1979; Walter and

Lien, 1985; Perkes, 1973; Swan, 1970; Towler, 1969; Fortner and Mayer, 1983, 1988; Fortner, 1978).

Income, age, sex, education, rural-urban residence, occupation, television news exposure, and race have all been examined for correlations with environmental knowledge. Males tend to be more environmentally literate (Buethe, 1985; Blum, 1987; Arcury, et. al., 1985; Arcury, Scollay, and Johnson, 1985, Fortner and Mayer, 1988 and 1983; Fortner and Teates, 1980). Environmental knowledge is frequently found to be correlated with education level (Baily, 1971; Arcury, et. al, 1975; Arcury, et. al., 1985; Caron, 1989).

Results of surveys on public environmental concern indicate that public concern has generally remained consistent and strong since 1969 (Great Lakes Science Advisory Board, 1987). However, several studies found declines in concern during the 1970's (Honnold, 1984; Thompson and Gasteiger, 1985; Dunlap and Dillman, 1976, Dunlap, et.al., 1979).

Since 1969, responses to environmental public opinion polls have not varied significantly by race, age, or sex, but concern has been somewhat associated with income and most closely with education (Great Lakes Science Advisory Board, 1987). In reviewing studies of environmental concern, Van Liere and Dunlap (1980) conclude that younger people tend to be more environmentally concerned, there is a moderately strong relationship between education and concern, urban residents tend to be somewhat more concerned than rural residents, liberals tend to be more concerned than conservatives, and sex, income, and occupation are not substantially associated with environmental concern. Correlations between various measures of environmental concern and sociodemographic characteristics vary considerably among studies suggesting that environmental concern may be a fairly broad concept, that different types of concern may be related to demographic characteristics in different ways, and that environmental concern may be widespread in American society (Van Liere and Dunlap, 1981).

Television seems to be the major source of environmental information for most people (Fortner and Mayer, 1983 and 1988; Fortner and Teates, 1980; Fortner and Lyon, 1985; Fortner, 1985; Blum, 1987; Murch, 1971; Perkes, 1973; Bohl, 1976; Richmond, 1976; Alaimo and Doran, 1980; SIPI, 1989; Kent and Rush, 1971; Walter and

Lien, 1985). Television documentaries have also been shown to increase environmental knowledge levels and produce positive, although temporary, attitude shifts (Fortner, 1985; Fortner and Lyon, 1985). Those with lower incomes and lower education levels tend to use television and broadcast media as their primary information source, while those with higher incomes and higher education levels tend to favor print media (Wade and Schramm, 1969; Williams, et. al., 1977; Kent and Rush, 1978; Williams and Lindsay, 1978). People who are environmentally knowledgeable and concerned tend to use specialized media (Arbuthnot, 1977; Sellars and Jones, 1973; Novic and Sandman, 1974). Outdoor experiences may also be important in shaping environmental concern (Ditton and Goodale, 1974; Harry, et. al., 1969).

Given the generally low levels of environmental knowledge found among the public, the assumption that broad public environmental literacy is a prerequisite of a quality environment, and the frequency with which television is cited by the public as a primary source of environmental information, television would seem to have an important role to play in the development of public environmental knowledge and concern.

CHAPTER III

Methodology

Research Design

This study involved several research designs. First, the study involved descriptive research of a survey nature. The purpose of this research was to explore and describe public knowledge of and opinions toward the Great Lakes. This design used a one page written questionnaire to collect data from 570 shoppers at two Cleveland, Ohio, area shopping centers.

Secondly, the study involved an ex post facto relational study. The purpose of this research was to explain the factors associated with public knowledge of and opinions toward the Great Lakes. Data on the demographic characteristics of the sample populations were collected.

Finally, the study involved experimental research using a posttest-only control group design. The treatment was exposure to a television broadcast of selected items from the Great Lakes Survey. The observations were scores on the broadcast items and nonbroadcast items of the knowledge section of the survey administered at the Cleveland area libraries. The library respondents who watched the broadcast acted as their own comparison group because in the treatment, they were exposed to only four of the twelve questions on the observation instrument. Their scores on the broadcast items represent the observation of the treatment group, while their scores on the nonbroadcast items represent the observation of the comparison group. The threat to external validity of this design is the fact that the library respondents who watched the survey were not a random sample, rather they self-selected to participate in the survey, limiting the generalizability of the findings.

Survey Development

Issues Identification

There are a great many environmental issues related to the Great Lakes. In order to develop knowledge questions pertaining to these issues, a list of such issues was first developed. Documents prepared by the International Joint Commission, the International Association for Great Lakes Research, the Great Lakes Commission, and the Council of Great Lakes Managers were studied to determine which environmental issues have priority for those groups in the near future (see References Used In Issue List Preparation in Appendix A). A composite list of issues was prepared and sent to a review panel (see Issues Review Panel List in Appendix A) consisting of representatives of Great Lakes oriented governmental, industrial, and private organizations throughout the Great Lakes basin. Comments and suggestions from this panel were used to refine the original issue list.

Knowledge Test

Knowledge questions for the survey were written by graduate students in a Great Lakes Education Workshop at The Ohio State University in June 1988, were taken from the 1979 and 1983 surveys of student knowledge of the Great Lakes, and were developed by the researchers during the summer of 1988. Accuracy of questions and answers were checked against Great Lakes reference books and technical reports (see Great Lakes Survey Reference List in Appendix B). A set of one hundred questions was initially developed. These questions were reviewed by science educators at The Ohio State University and were revised several times during January and February, 1989, for structure and vocabulary and to match their content to the issues list.

The survey questions were developed as a paper and pencil test of adult knowledge. A multiple choice format was chosen based on a review of the literature of public environmental knowledge. Several previous studies used the respondents' own assessment of their level of environmental knowledge, or a researcher's assessment of the quality of a respondent's answer to an open-ended question and thus were subject to bias. Multiple choice items such as those used in the National Environment Test (Lynch and Chandler, 1971) and Arcury and Johnson's (1987) statewide survey of public environmental

knowledge were chosen as a more objective measure. Each multiple choice question had one correct answer. Survey questions demonstrated either the importance of Great Lakes as a resource or the extent of an environmental problem. The questions were designed to create cognitive dissonance among viewers in the broadcast survey and to encourage further information seeking.

The Great Lakes Issues List (see Appendix A) developed earlier was used as a guide in selecting thirty-four of the knowledge questions for panel review. Proposed questions for the survey, a copy of the issues list, an abstract of the study, and a cover letter were sent to a panel of six reviewers (see Survey Review Panel in Appendix B) from the Great Lakes Commission, The International Joint Commission, Great Lakes Tomorrow, the Ohio Coastal Resource Management Program, the International Association for Great Lakes Research, and the Ohio Academy of Science. These reviewers were asked to examine the questions for accuracy and to comment on whether the questions reflected the issues as stated on the list. This served to establish content validity of the survey instrument. The reviewers' input was used to further revise the multiple choice questions, and two questions were added.

The thirty-six knowledge questions were then divided between two survey forms to shorten the test respondents would take. Each form had nineteen multiple choice questions. Two questions were the same on both forms, one asking about the "ecosystem approach," and one about the major source of phosphorus in the Lakes.

Opinion Statements

Opinion statements were written by the researchers based on a review of the literature. Environmental attitude and belief statements used in other studies were revised to be appropriate to the Great Lakes region. Forty-six statements were initially chosen, then revised to produce twenty-six statements. These statements were divided evenly between the two survey forms, with thirteen different statements appearing on each. A Likert scale format was chosen for the opinion statements because this has been the format most frequently used in researching public environmental attitudes and concern. Respondents indicated on a scale of 1 to 5 whether they strongly agreed, agreed, were undecided or had no opinion, disagreed, or strongly disagreed with each statement. The

responses made by the survey review panel to the opinion statements were considered the most appropriate response for each statement. Statements for which a response of 1 or 2 was considered most appropriate were recoded to 5 or 4. The mean was then calculated for the total of the nine opinion statements to represent a respondent's environmental opinion score, with 5 being the most positive score.

Vocabulary Perception

A word checklist was developed by the researchers based on an examination of the vocabulary used in the multiple choice items and on a review of the literature on public environmental knowledge. In particular, Buethe (1985) and Buethe and Smallwood's (1987) studies of teachers' environmental literacy were used to determine the types of environmental terms the public might not understand. Respondents indicated on the checklist whether they did or did not understand the term by marking yes or no. Respondents' word score was then scored as the total number of words they indicated knowing out of 14. The purpose of the word checklist was to determine what Great Lakes and environmental terms the public does and does not understand and whether their understanding or lack thereof influenced their ability to answer the multiple choice knowledge questions. The same fourteen words were included on both forms of the survey.

Field Testing

The survey questionnaire was field tested at the Worthington Square shopping center in Columbus, Ohio, on Saturday, March 11, 1989, to determine its appropriateness and suitability for a public audience. The three page survey contained nineteen multiple choice questions, fourteen terms on the word checklist, and thirteen opinion statements. Researchers stopped shoppers entering the mall and asked them to complete the questionnaire. Respondents were also asked to comment on the questionnaire itself. Ninety respondents completed the questionnaire.

The survey was also field tested with 11 students in a Marine and Aquatic Education class at The Ohio State University on Monday, March 13. This group represented an informed audience. The mean score of the 81 mall respondents who completed the knowledge test was 8.3/19. The mean score of the students was 14.4/19. Thus, the

questionnaire appeared to be reliably measuring knowledge about the Great Lakes.

Following the field test, the multiple choice items and opinion statements were further revised, while the word checklist remained the same. The format of the questionnaire was changed to make the survey shorter as a result of respondents' and students' comments and responses to the survey. Three parallel forms of the survey were used to increase the total number of multiple choice questions and opinion statements that could be presented. The questions were divided between three forms with twelve multiple choice items, nine opinion statements, and fourteen vocabulary terms on each. Two of the multiple choice questions, one of the attitude statements and all of the words on the vocabulary checklist were the same among the three forms of the survey.

Demographic Items

Demographic questions were added to the survey at this point. Demographic questions were based on a review of the literature on correlates of public environmental knowledge and opinion. Demographic questions asked where people get most of their information about the Great Lakes, whether they were a member of an environmental interest group, sport fishing club, boating club, or civic or community group, their age, sex, number of years of school completed, approximate annual family income, and the number of people supported by this income. The revised questionnaire, including demographic items, was again sent to the review panel for comments. Their comments were used for further revision. Finally, coding bars were added for entering respondents' responses as data in the computer for analysis.

The final survey was printed on the front and back of one sheet of white paper (see Appendix C). The questionnaire consisted of four parts: twelve multiple choice factual or conceptual questions testing knowledge about the Great Lakes, nine Likert scale-type questions to measure on a scale of 1 to 5 attitudes toward and beliefs about the Lakes, fourteen vocabulary terms about Great Lakes topics for which respondents indicated whether they knew the term, and the demographic items listed above. In addition, a question asking how long respondents have lived in Cleveland was included. The first and last multiple choice questions (which lake produces the most fish and the "ecosystem approach") were the same on each form as was the last opinion statement (Lake Erie is

very polluted and ugly). The vocabulary checklist was the same on all three forms. An item asking respondents which days they had viewed the WJW-TV8 broadcast was later added to these questionnaires for use in the library survey.

Survey Administration

Shopping Mall Baseline Study

The three parallel forms of the survey were given Saturday, April 15, in two shopping areas in the City of Cleveland, Ohio, which is located on Lake Erie. The two shopping centers were Randall Park Mall, a suburban mall in middle income southeast Cleveland, and The Arcade, a renovated, upscale shopping center located in downtown Cleveland. These malls were chosen to provide a range of socioeconomic levels and a racially mixed sample population.

Surveys were administered by Ohio Sea Grant faculty and graduate students in an Environmental Communications Research class at The Ohio State University. Survey administrators attempted to stop all adult shoppers as they passed by the survey tables to request their participation. Posters announcing the WJW-TV8 broadcast were displayed to encourage interest and participation in the survey and the broadcast. The fact that the results of the mall survey were going to be broadcast on Cleveland television later in the month also encouraged shoppers to participate. The three forms of the survey were randomly distributed among shoppers. The surveys were anonymous unless participants requested that further information be sent to them. The addresses thus obtained were used to develop a mailing list for the Ohio Coastal Resources Management Program.

Respondents' answers to the questionnaires at Randall Park and The Arcade were scored for broadcast in the televised survey. The data from these surveys provided baseline information concerning public knowledge of and opinions toward the lakes. Responses to the multiple choice items also gave an indication of the difficulty of the questions.

Television Broadcast of Survey Items

Because of its interest in Lake Erie, WJW-TV8 in Cleveland participated in the project by televising selected questions from the surveys. Television staff screened items

from the three survey forms for the station's requirements of length and content suitability. Ten multiple choice survey items were selected by the television station for airing two per day on the 6:00 evening news. The researchers provided WJW-TV8 with information from the Randall Park and Arcade Mall samples on responses of Clevelanders to the questions selected for broadcast.

The survey was broadcast the third week in May, 1989, a ratings week for the television station. WJW-TV8 treated this project, the Lake Erie Guide, as a major series for the week in which it was shown. On Monday evening, the series was introduced by Virgil Dominick, president and station manager. He gave a brief overview of the lake, its resources, economic value, and the people living along the lake and mentioned that people could get a copy of the Dick Goddard Lake Erie Guide and Game by completing the whole survey at an area library.

The selected survey questions, followed by the four answer choices, were presented by Dick Goddard, the station's meteorologist, during the weather portion of the news. Written questions appeared on screen and were read by Goddard. News personnel attempted to answer the questions. Goddard then gave the correct answer. The percent of people who answered the question correctly in the shopping mall samples was also given. In this way, viewers were able to compare their responses to those of other respondents. Each evening, Goddard invited and encouraged viewers to go to their local library to take the full survey from which the questions had been selected. The station then presented a video segment to illustrate the issue or topic covered by the question. These segments were narrated by Dick Goddard.

The broadcast covered the following questions and video segments:

Monday, May 22: Questions A1, B1, C1 (these were the same on all three forms) and A10. Video segment on commercial fishing on the Canadian side of Lake Erie and management of the fishery (running time 2:10).

Tuesday, May 23: Questions A11 and A9. Video segment on Ohio's wineries and grape harvest and its dependence on lake-effect climate (running time 2:00).

Wednesday, May 24: Questions C11 and C7. Video segment on tourism in the Lake Erie islands and walleye charter fishing in Cleveland (running time 2:00).

Thursday, May 25: Questions C9 and B9. Video segment on development of public parks along the shoreline in Cleveland (running time 2:00).

Friday, May 26. Questions B8 and B2. Video segment on underwater shipwrecks in Lake Erie (running time 2:35).

Library Test

Collection of additional public responses as an indication of the television news show's educational impact was accomplished through survey forms distributed to the Cleveland City and Cuyahoga County libraries. These forms were distributed prior to the televised survey so that the libraries would have them during the broadcast. The libraries were a natural distribution point for the questionnaires, since additional sources of Great Lakes information were accessible to the public there. The researchers also provided libraries with a list of Great Lakes reference materials and a copy of the Great Lake Erie textbook (Fortner and Mayer, 1987). In this way, survey respondents seeking to learn more about the Great Lakes had resources available to them.

The surveys were administered by library personnel. To encourage patron participation, each library displayed a poster, provided by the central branch, which announced the survey. All participants who returned a completed survey to a librarian received a "Dick Goddard Lake Erie Guide and Game" (see Appendix F) family trivia-style board game developed at The Ohio State University as an incentive to take the survey. They also received a "Lake Erie Fact Sheet" (see Appendix F) which contained the answers to the questions found on all three of the survey forms. In this way, respondents were provided with further information about the Great Lakes, and any cognitive dissonance they experienced as a result of taking the survey was relieved.

Libraries returned completed questionnaires to the researchers at the end of the week in which the broadcast was televised. At the end of the next week, libraries returned all remaining questionnaires to their main branch. These were picked up by one of the researchers the following week. Completed questionnaires were received from nineteen libraries, 319 from county branches and 142 from city branches.

Research Questions

The research questions guiding this study included:

1) Are there any differences by site (county vs. city library, Randall Park vs. Arcade Malls) in the mean knowledge score on the survey, mean number of words known, mean environmental opinion, demographic characteristics of respondents, or, for library respondents, their viewing of the WJW-TV8 broadcast? If there are no substantial differences, combine questionnaires by site for further analysis.

2) Are there any differences between library respondents who took the survey week 1 and those who took it week 2 in the mean knowledge score on the test, mean number of words known, mean environmental opinion, demographic characteristics, or their viewing of the WJW-TV8 broadcast? If there are no substantial differences, combine questionnaires by week for further analysis.

3) Are there any differences among respondents who took form A, B, or C of the questionnaire in the mean number of words known, demographic characteristics of respondents, or, for library respondents, their viewing of the WJW-TV8 broadcast ? If there are no substantial differences, combine questionnaires by week for further analysis.

4) What are the relationships among score on the knowledge test, number of words known, and environmental opinion of respondents?

5) What are the relationships between knowledge score, words known, and environmental opinion and demographic characteristics of respondents and, for library respondents, their viewing of the WJW-TV8 broadcast?

6) Are there any differences in mean knowledge score on the test, in mean environmental opinion, and in mean number of words known between male and female respondents?

7) Are there any differences in mean knowledge score on the test, in mean environmental opinion, and in mean number of words known between respondents who did and did not watch the t.v. broadcast?

8) Are there any differences in demographic characteristics between library respondents who did and did not watch the broadcast?

9) Are there any differences in mean knowledge score on the test, mean number of words known, or mean environmental opinion between respondents citing each of the information sources as their primary source of information about the Great Lakes?

10) Are there any differences in the information source cited as the primary source of information about the Great Lakes by respondent's demographic characteristics and, for library respondents, their viewing of the WJW-TV8 broadcast?

11) Are there any differences between respondents who belong and do not belong to various organizations in knowledge score on the test, environmental opinion, number of words known, demographic characteristics, primary information source used, and, for library respondents, their viewing of the WJW-TV8 broadcast?

12) What are the relationships between respondents' indication of their understanding of specific environmental terms and their score on related knowledge item questions?

13) Are there any differences in mean scores on the broadcast and nonbroadcast knowledge items for for mall respondents and for those library respondents who watched all the days that the broadcast items were televised?

Data Analysis

Responses from the mall and library questionnaires were coded using the coding bars on the survey forms and were entered in The Ohio State University mainframe computer by the researchers and by students in the Environmental Communications Research class. Data analysis was conducted using the SPSSx Statistical Package for the Social Sciences.

The following variables were considered nominal level: knowledge item questions 1-12; vocabulary words 1-14; information sources 1-6; membership categories 1-5; sex; week the survey was taken; whether respondents watched the survey; days they watched the survey; site; and the form of survey. The remaining items were considered interval level: total knowledge score; opinion statements 1-9; total opinion score; total word score; age; number of years lived in Cleveland; years of education; annual income; family size; number of organizations to which respondents belong; and number of days respondents viewed the broadcast.

To investigate differences in interval variables by a nominal variable with two levels, separate variance estimate t-tests were used. To investigate differences in interval variables by a nominal variable with more than two levels, analysis of covariance was used. To explore relationships between two interval variables, Pearson product-

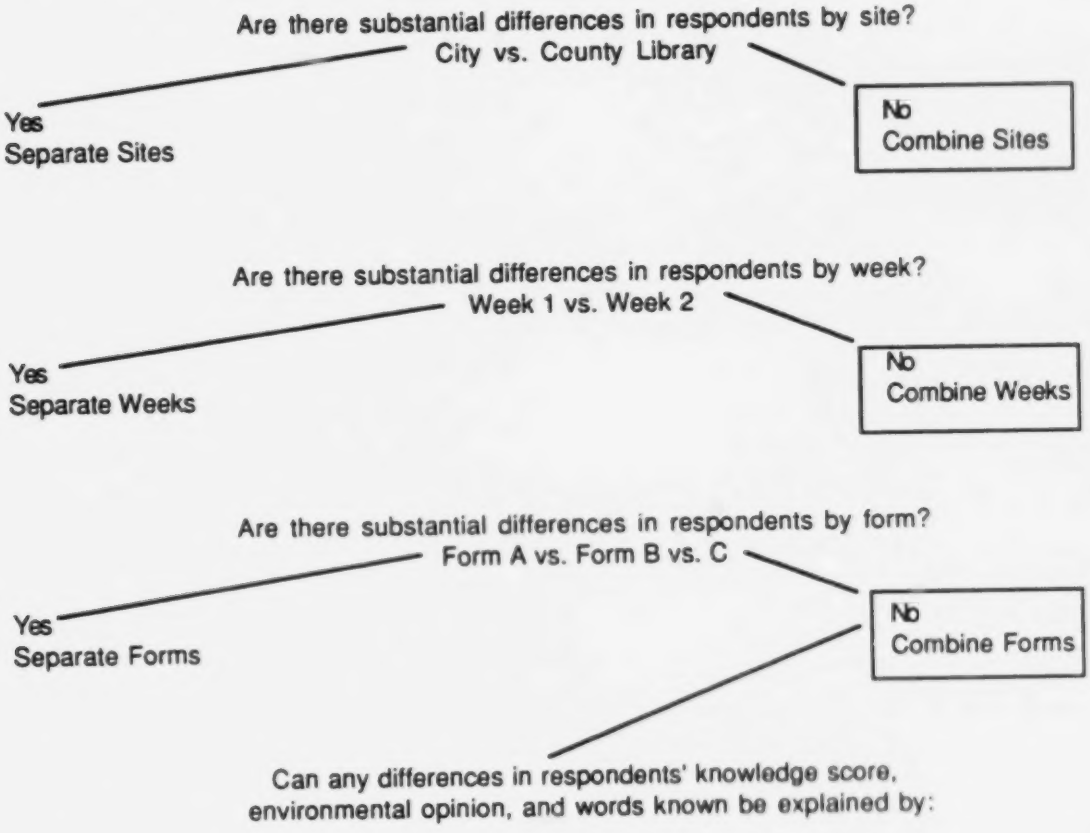
moment correlations were used. To explore relationships between two nominal variables, cross tabulations with phi or Cramer's V as the statistic were used.

Since the library surveys included the ten questions whose answers were given on television, it was expected that library respondents who had watched the broadcast would be able to answer those items correctly. The library surveys thus provided a measure of the station's educational impact on the community. They also demonstrated whether and how television can be used to enhance public information levels about the Great Lakes.

Survey items were divided into two groups, broadcast and nonbroadcast questions. Each of the three survey forms contained four questions that had been broadcast on television and eight that had not been broadcast. The mean on the nonbroadcast items was divided by two and compared with the mean on the broadcast items. Thus both means were on a basis of number answered correctly out of four questions. The statistical test used was a t-test for paired samples. For the library survey, only those questionnaires in which respondents had actually watched the broadcast on the days the broadcast items from that form were televised were selected for comparing means. For the mall survey, all respondents' forms were used as all of the respondents had taken the survey prior to the broadcast.

Demographic characteristics of the experimentally accessible populations, the shopping mall respondents and library respondents, were compared to determine their equivalency. Demographic characteristics of the television station's news show viewership provided by the WJW-TV8 and those of the target population, adults in the City of Cleveland based on 1980 census data, were also investigated to judge the representativeness of the mall and library samples, and thus the generalizability of the research findings.

Outline for Data Analysis



information source
membership in various organizations
number of organizations belonged to
sex
age
number of years lived in Cleveland
education level
annual income
watching of the broadcast
number of times viewing the broadcast
understanding of environmental terms

Figure 1

CHAPTER IV

Results

Library Results

Was there a difference by site (county vs. city library) in the mean score on the test (score), mean number of words known (words), mean environmental opinion (opinion), mean age of respondents (age), mean number of years lived in Cleveland (live), mean education level (educ), mean annual income (income), mean number of organizations to which respondents belong (belong), or mean number of days they viewed the broadcast (viewed)?

The null hypothesis for each variable was the means were equal for respondents from the city and from the county libraries. The alternate hypothesis was the means were not equal for the two sites. Each hypothesis was tested with alpha=.05 using separate variance estimate t-tests for independent groups.

Form A Week 1: The null hypothesis was rejected (alpha = .03) for the variable income. Respondents at county libraries had significantly higher yearly incomes than respondents at city libraries. The null hypothesis was accepted for all other variables. There were no differences between city and county respondents on the variables score, words, opinion, age, live, education, viewed, or belong.

Form A Week 2: The null hypothesis was rejected for the variables opinion (alpha=.04), and income (alpha=.02). Respondents at county libraries had significantly higher mean opinion scores and significantly higher incomes than respondents from city libraries. Respondents did not differ significantly on the variables score, words, viewed, age, live, education, or belong.

Form B Week 1: The null hypothesis was rejected (alpha=.04) for the variable score. Respondents at county libraries scored significantly higher than respondents from city libraries. The null hypothesis was accepted for all other variables. There were no differences between city and county respondents on the variables words, opinion, age, live, education, income, viewed, or belong.

Form B Week 2: The null hypothesis was rejected for the variables score (alpha=.01), opinion (alpha=.02), education (alpha=.00), and income (alpha=.01). Respondents at the county libraries scored significantly higher on the knowledge test, had significantly higher mean opinion scores, had significantly more years of education, and had significantly higher annual incomes than respondents at city libraries. The null hypothesis was accepted for all other variables. Respondents did not differ significantly in the variables words, viewed, age, live, or belong.

Form C Week 1: The null hypothesis was rejected (alpha=.00) for the variable education. Respondents at county libraries had significantly higher education levels than those at city libraries. The null hypothesis was accepted for all other variables. There was no significant difference between city and county library respondents in their score on the knowledge, opinion, or word sections of the test, how many days they watched the broadcast, their average age, number of years they have lived in Cleveland, annual income, or number of organizations to which they belong.

Form C Week 2: The null hypothesis was accepted for all variables. County and city respondents did not differ significantly on the variables score, words, opinion, viewed, age, live, education, income, or belong.

What was the relationship between site (county or city library) and the sex of respondents (sex), their information source (info), and whether or not they watched the t.v. broadcast (watch)?

Form A Week 1: There was a low association between site and information source (Cramer's V=.24). There was a negligible association between site and sex (phi=.06) and between site and watch (phi=.07).

Form A Week 2: There was a low correlation between site and sex (phi=.14) and site and information (Cramer's V=.26). The association between site and watch was negligible (phi=.05).

Form B Week 1: There was a low association between site and sex (phi=.29) and site and information source (Cramer's V=.28). The association between site and watch (phi=.18) was negligible.

Form B Week 2: There was a low correlation between site and information source (Cramer's V=.24). The relationships between site and sex (phi=.04) and site and watch (phi=.01) were negligible.

Form C Week 1: There was a moderate association between site and information source (Cramer's V=.37), a low association between site and sex of respondents (phi=.13) and a negligible association between site and whether or not respondents watched the broadcast (phi=.05). County library respondents tended to cite newspapers as their primary information source more frequently than did city respondents.

Form C Week 2: The association between site and information source was moderate (Cramer's V=.34). There was a low correlation between site and sex (phi=.10) and between site and watch (phi=.16). County respondents tended to cite newspapers and lake activities as their primary information source more frequently than did city respondents.

What were the differences between respondents who took the survey week 1 and those who took it week 2 in the mean score on the test, mean number of words known, mean environmental opinion, mean number of days respondents viewed the broadcast, mean age of respondents, mean number of years they have lived in Cleveland, mean education level, mean annual income, and mean number of organizations to which respondents belong?

The null hypothesis for each variable was the means were equal for respondents from week 1 and respondents from week 2. The alternate hypothesis was the means were not equal for respondents from week 1 and from week 2. Each hypothesis was tested with alpha=.05 using separate variance estimate t-tests for independent groups.

Form A (sites combined): The null hypothesis was accepted for all variables. There were no significant differences in any of the variables between the two weeks.

Form B (sites combined): The null hypothesis was rejected for score (alpha=.00). Those taking the survey week 1 scored significantly higher on the knowledge items than those taking the survey week 2. For all other variables, the null hypothesis was accepted. There were no differences between week 1 and week 2 respondents on the variables words, opinion, viewed, age, live, education, income, or belong.

Form C (sites combined): The null hypothesis was accepted for all variables. There were no significant differences by week in any of the variables.

What was the relationship between the week respondents took the questionnaire (week) and the sex of respondents, between week and respondents' information source, and between week and whether or not respondents watched the broadcast?

Form A (sites combined): The relationships between week and sex (phi=.10) and week and information (Cramer's V=.27) were low. The relationship between week and watch (phi=.08) was negligible.

Form B (sites combined): The associations between week and sex (phi=.10), week and information (Cramer's V=.11), and week and watch (phi=.12) were low.

Form C (sites combined): The relationships between week and sex (phi=.11), week and information (Cramer's V=.10), and week and watch (phi=.10) were low.

What was the difference in mean number of words known, mean age, mean number of years lived in Cleveland, mean education level, mean annual income, mean number of times respondents viewed the broadcast, and mean number of organizations to which respondents belong among the three groups who took the three forms of the questionnaire (A, B, and C)?

The null hypothesis for all variables was the means for groups A, B, and C were equal. The alternate hypothesis was the means were not equal for the three groups. The hypotheses were tested at alpha=.05 using one way analysis of variance. The null hypothesis was accepted for all variables except words and age. There were no significant

differences among the groups A, B, and C for the number of years respondents have lived in Cleveland, their education level, income, number of times they viewed the broadcast, or number of organizations to which they belong. A Tukey post hoc analysis was used to investigate differences between groups for the variables words and age. At alpha=.05, there was a significant difference between group A and Group C in the mean number of words known. Group A knew significantly more words than did Group C. At alpha=.05, there was a significant difference between Group B and Group C in the mean age of respondents. Respondents who took survey form B were significantly older than respondents in Group C.

What was the relationship between the form of the survey (A, B, or C) that respondents took and sex of the respondents, between form and the primary information source cited by the respondent, and between form and whether or not the respondent watched the broadcast?

The relationships between survey form and sex (phi=.06), between form and information source (Cramer's V=.09), and form and watch (phi=.02) were negligible.

What was the correlation between score on the knowledge test and number of words known, environmental opinion of respondents, their age, number of years lived in Cleveland, education level, annual income, number of groups to which they belong, and number of times respondents viewed the broadcast?

Form A: There was a moderate correlation between score and words known (r=.33) and between score and education (r=.39). Relationships between score and opinion (r=.28), age (r=.28), live (r=.18), viewed (r=.17), and belong (r=.14) were low. The relationship between score and income (r=.07) was negligible.

Form B: There was a moderate correlation between score on the test and words known (r=.41), between score and opinion (r=.32), and between score and education (r=.32). Relationships between score and age (r=.12), income (r=.17), and belong (r=.12) were low. The relationship between score and viewed was negligible (r=.03).

Form C: There was a substantial correlation between score and words (r=.50). The relationship between score and opinion (r=.40) was moderate. Correlations between score and education (r=.29), age (r=.19), live (r=.13), belong (r=.13), income (r=.10), age (r=.19), and viewed (r=.10) were low.

Combined Forms: There was a moderate correlation between total knowledge score and words known (r=.36) and total knowledge and education (r=.34). Relationships between total knowledge and total opinion (r=.26), age (r=.16), live (r=.11), and belong (r=.13) were low. Associations between total knowledge and income (r=.09) and viewed (r=.08) were negligible (Table 1).

What was the correlation between respondents' environmental opinion and the number of words known, their age, number of years they have lived in Cleveland, education level, income, number of groups to which they belong, and number of times they viewed the broadcast?

Form A: The relationships between opinion and viewed (r=.12) and opinion and belong (r=.22), and opinion and with words (r=.15) were low. Relationships between opinion and age (r=.09), opinion and live (r=.06), opinion and education (r=.07), and opinion and income (r=.01) were negligible.

Form B: The relationships between opinion and education (r=.31) and opinion and words (r=.31) were moderate. The relationship between opinion and income (r=.17), and opinion and live (r=.10) were low. Relationships of opinion with age (r=.02), viewed (r=.05), and belong (r=.06) were negligible.

Form C: The relationship between opinion and words (r=.36) was moderate and between opinion and education (r=.20) was low. Associations of opinion with age (r=-.03), live (r=.04), income (r=.05), viewed (r=.08), and belong (r=.06) were negligible.

Combined Forms: There were low correlations between total opinion and words known (r=.28), education level (r=.18), viewed (r=.10), and belong (r=.13). The relationships between total opinion and age (r=.03), live (r=.07), and income (r=.07) were negligible (Table 2).

TABLE 1
Correlation of Knowledge Score with Words, Opinion, and Demographics — Library Sample, Pearson Correlation

	Form A	B	C	Combined
Words Known	r = .33	.41	.50	.36
Education	r = .39	.32	.29	.34
Opinion	r = .28	.32	.40	.26
Age	r = .28	.12	.19	.16
Belong	r = .14	.12	.13	.13
Live	r = .18	.06	.13	.11
Income	r = .07	.17	.10	.09
Viewed	r = .17	.03	.10	.08

TABLE 2
Correlation of Environmental Opinion with Score, Words, and Demographics — Library Sample, Pearson Correlation

	Form A	B	C	Combined
Words Known	r = .15	.31	.36	.28
Score	r = .28	.32	.40	.26
Education	r = .07	.31	.20	.18
Belong	r = .22	.06	.06	.13
Viewed	r = .12	.02	.08	.10
Live	r = .06	.10	.04	.07
Income	r = .01	.17	.05	.07
Age	r = .09	.02	-.03	.03

What was the correlation between number of words respondents knew and respondents' age, number of years they have lived in Cleveland, their education level, their annual income, number of groups to which they belong, and number of times they watched the broadcast?

Form A: There were low correlations between words and age (r=.19), live (r=.12), education (r=.29), and belong (r=.15). Relationships between words and income (r=.01), and words and viewed (r=-.02) were all negligible.

Form B: There were low relationships between words and age (r=.17), live (r=.17), education (r=.26), and belong (r=.13). The relationships between words and income (r=-.01) and words and viewed (r=-.04) were negligible.

Form C: Associations between words and age (r=.20), words and live (r=.15), words and education (r=.18) and words and viewed (r=.11) were low. Associations between words and income (r=.02) and belong (r=.09) were negligible.

Combined Forms: Correlations between number of words known and age (r=.19), words and live (r=.15), words and education (r=.23), and words and belong (r=.12) were low. Correlations between words and income (r=.01) and words and viewed (r=.05) were negligible (Table 3).

What was the difference in mean score on the test, in mean environmental opinion, and in mean number of words known between male and female respondents?

The null hypotheses were no differences in mean score, mean opinion, or mean words. The alternate hypotheses were the means for males and females were not equal for score, opinion, and words. Each hypothesis was tested at alpha=.05 using separate variance t-tests for independent groups.

Form A: Males scored an average of 6.8 (sd=1.79) on the knowledge items, 4.23 (sd=.41) on the opinion items, and 10.5 (sd=2.51) on the number of words known. Females scored a mean of 6.0 (sd=2.12) on the test, had a mean opinion score of 4.0 (sd=.47) and knew an average of 9.2 (sd=2.93) words. At alpha=.05, the null hypothesis was rejected for all three variables. Males scored significantly higher on the

knowledge test (alpha=.02), significantly higher on the opinion items (alpha=.03), and knew significantly more words (alpha=.01) than did females.

Form B: Males scored a mean of 6.7 (sd=1.92) on the knowledge items, 3.7 (sd=.45) on the opinion items, and 10.2 (sd=2.56) on the words known. Females scored an average of 5.8 (sd=1.82) on the knowledge test, 3.8 (sd=.48) on the opinion scale, and 8.4 (sd=3.35) on the number of words known. At alpha=.05, the null hypothesis was accepted for opinion (alpha=.06) and rejected for score (alpha=.00) and words (alpha=.00). Males and females did not differ significantly in their mean opinion score. Males scored significantly higher on the knowledge test and knew significantly more words than did females.

Form C: The mean score for males on the knowledge items was 8.1 (sd=2.01), on the opinion items was 3.8 (sd=.43), and on the mean number of words known was 9.7 (sd=2.84). The mean score for females on the knowledge items was 7.5 (sd=1.99), on the opinion items was 3.9 (sd=.32), and on the number of words known was 8.2 (sd=2.73). At alpha=.05, the null hypothesis was accepted for the variables score (alpha=.06) and opinion (alpha=.19) and rejected for the variable words (alpha=.00). Males and females did not differ significantly in their scores on the knowledge or opinion items. Males knew significantly more words than did females.

Combined Forms: Males scored an average of 7.2 (sd=2.01) on the knowledge items, 3.9 (sd=.49) on the opinion items, and 10.1 (sd=2.64) on the number of words known. Females scored a mean of 6.4 (sd=2.11) on the knowledge items, 3.9 (sd=.44) on the opinion items, and 8.7 (sd=3.03) on the number of words known. At alpha=.05, the null hypothesis was accepted for total opinion (alpha=.70) and rejected for total knowledge (alpha=.00) and for words (alpha=.00). There was no significant difference between males and females on mean environmental opinion. Males scored significantly higher than females on the knowledge items on the test and knew significantly more words (Table 4).

What was the difference in mean knowledge score on the test, mean opinion, and mean number of words known between respondents who did and did not watch the t.v. broadcast?

TABLE 3
Correlation of Words Known with Knowledge Score, Opinion, and Demographics — Library Sample, Pearson Correlation

	Form A	B	C	Combined
Score	r = .33	.41	.50	.36
Opinion	r = .15	.31	.36	.28
Education	r = .29	.26	.18	.23
Age	r = .19	.17	.20	.19
Live	r = .12	.17	.15	.15
Belong	r = .15	.13	.09	.12
Viewed	r = -.02	-.04	.11	.05
Income	r = .01	-.01	.02	.01

TABLE 4
Comparison of Knowledge Score, Opinion and Words Known by Sex — Library Sample, Combined Forms T-Test

	N	Mean	SD	DF	Probability
Score					
Male	211	7.2	2.01	437	.00
Female	228	6.4	2.11		
Opinion					
Male	211	3.90	.49	420	.70
Female	228	3.90	.43		
Words					
Male	211	10.1	2.64	435	.00
Female	228	8.7	3.03		

The null hypotheses were no difference in mean score, mean opinion, or mean words between respondents who did and did not watch the broadcast. The alternate hypotheses were the means of respondents who did and did not watch the broadcast were not equal for score, opinion, and words. Each hypothesis was tested at alpha=.05 using separate variance estimate t-tests for independent groups.

Form A: The respondents who did not watch the broadcast had a mean score of 5.8 (sd=2.12) on the knowledge test, a mean opinion score of 4.0 (sd=.52), and a mean number of words known of 10.1 (sd=2.62). The respondents who watched the broadcast scored a mean of 6.7 (sd=1.96) on the test, 4.1 (sd=.39) on the opinion scale, and 9.5 (sd=3.18) on the number of words known. At alpha=.05, the null hypothesis was accepted for opinion and words and rejected for score. Respondents who did and did not watch the broadcast did not differ significantly in their mean opinion score (alpha=.14) or on the mean number of words known (alpha=.27). Those who watched the broadcast scored significantly higher on the knowledge test (alpha=.01) than respondents who did not watch the broadcast.

Form B: The respondents who did not watch the broadcast scored an average of 6.2 (sd=2.02) on the knowledge items, an average of 3.7 (sd=.53) on the opinion items, and an average of 9.4 (sd=2.81) on the words known. The respondents who watched the broadcast scored 6.4 (sd=1.84) on the knowledge items, 3.8 (sd=.40) on the opinion items, and 9.4 (sd=3.31) on the number of words known. At alpha=.05, the null hypothesis was accepted for all three variables. Respondents who did and did not watch the broadcast did not differ significantly on mean score (alpha=.44), on mean opinion (alpha=.24), or on mean number of words known (alpha=.95).

Form C: The respondents who did not watch the broadcast scored a mean of 7.7 (sd=1.94) on the knowledge test, a mean of 3.7 (sd=.35) on the opinion scale, and a mean of 8.5 (sd=2.86) on the words known. The respondents who watched the broadcast had a mean of 7.7 (sd=2.26) on the knowledge test, a mean of 3.8 (sd=.42) on the opinion scale, and a mean of 9.2 (sd=3.00) on the number of words known. At alpha=.05, the null hypothesis was accepted for all three variables. Respondents who did and did not watch the broadcast did not differ significantly on their mean knowledge scores,

(alpha=.83), mean opinion scores (alpha=.11), or their mean number of words known (alpha=.14).

Combined Forms: The respondents who did not watch the broadcast scored a mean of 6.6 (sd=2.18) on the knowledge items, a mean of 3.8 (sd=.48) on the opinion items, and a mean of 9.3 (sd=2.84) on the number of words known. The respondents who watched the broadcast scored 6.9 (sd=2.08) on the knowledge items, 3.9 (sd=.43) on the opinion items, and 9.4 (sd=3.17) on the number of words known. At alpha=.05, the null hypothesis was accepted for total knowledge (alpha=.15) and total words (alpha=.69) and rejected for total opinion (alpha=.01). Those who did and did not watch the broadcast did not differ significantly in their scores on the knowledge items or in the mean number of words they knew. Respondents who watched the broadcast had significantly higher mean opinion scores than those who did not (Table 5).

What was the difference in mean knowledge score on the test between respondents citing each of the information sources as their primary source of information about the Great Lakes?

The null hypothesis tested was the mean scores on the knowledge test were equal for the six information groups. The alternate hypothesis was the mean knowledge scores were not equal for the six groups. The hypothesis was tested at alpha=.05 using one way analysis of variance.

Form A: Mean knowledge scores ranged from 5.4 (sd=1.27) for group 3 (magazines) to 7.1 (sd=2.47) for group 4 (lake activities). The calculated F value was 1.87. The critical value of F (5,134) was 2.29. Therefore, the null hypothesis was accepted. There were no differences in mean knowledge scores between the six information groups.

Form B: Mean knowledge scores ranged from 6.2 (sd=1.90) for group1 (television) to 7.0 (sd=2.58) for group 6 (other). The calculated F value was .56. The critical value of F (5,120) was 2.29. Therefore, the null hypothesis was accepted. There were no significant differences in mean knowledge scores between the six information groups.

Form C: Mean knowledge scores ranged from 7.1 (sd=2.00) for group 1 (television) to 8.4 (sd=2.06) for group 4 (lake activities). The calculated F value was 1.61. The critical value of F (5,125) was 2.29. Therefore, the null hypothesis was accepted.

There were no significant differences in mean knowledge scores between the six information groups.

Combined Forms: Mean total knowledge scores ranged from 6.4 (sd=2.05) for group 1 (television) to 7.6 (sd=2.21) for group 4 (lake activities). The calculated F value was 2.48. The critical value of F (5,399) was 2.26. Therefore, the null hypothesis was rejected. A Tukey post hoc analysis was used to investigate differences in mean total knowledge scores between the six information source groups. At alpha=.05, there was a significant difference between group 1 and group 4. The respondents who cited lake and lakeshore activities as their primary source of information about the Great Lakes scored significantly higher on the knowledge items on the test than those who cited television (Table 6).

What was the difference in mean environmental opinion between the respondents citing each of the information sources as their primary source of information about the Great Lakes?

The null hypothesis was the mean opinion scores for the six information source groups were equal. The alternate hypothesis was the mean opinion scores were not equal for the six groups. The hypothesis was tested at alpha=.05 using one way analysis of variance.

Form A: Mean opinion scores ranged from 4.0 (sd=.49) for group 1 (television) to 4.4 (sd=.36) for group 3 (magazines). The calculated F value was 1.74. The critical F value (5,134) was 2.29. Therefore, the null hypothesis was accepted. There were no significant differences between the six information groups in mean opinion scores.

Form B: Mean opinion scores ranged from 3.7 (sd=.53) for group 3 (magazines) to 3.8 (sd=.41) for group 2 (newspapers). The calculated F value was .81. F critical (5,128) was 2.29. Therefore the null hypothesis was accepted. There were no significant differences in mean opinion scores between the six information groups.

Form C: Mean opinion scores ranged from 3.7 (sd=.39) for group 1 (television) to 4.0 (sd=.30) for groups 6 (other). The calculated F value was 1.41. The critical value of F (5,125) was 2.29. Therefore, the null hypothesis was accepted. There were no significant differences in mean opinion scores between the six groups.

TABLE 5
Comparison of Knowledge Score, Opinion, and Words Known for Viewers and Nonviewers — Library Sample, Combined Forms T-Test

	N	Mean	SD	DF	Probability
Score					
Viewers	242	6.912	2.08	364	0.15
Nonviewers	175	6.612	2.17		
Opinion					
Viewers	242	3.955	.43	345	.01
Nonviewers	175	3.835	.48		
Words					
Viewers	242	9.414	3.17	397	.69
Nonviewers	175	9.314	2.84		

TABLE 6
Comparison of Knowledge Score by Information Source Used— Library Sample, ANOVA
letters represent groups between which there was a significant difference

	TV a	Papers	Magazines	Lake a	Other	Museum
N	178	114	24	34	28	27
Mean	6.41	7.00	6.67	7.56	7.04	6.56
SD	2.05	2.04	2.12	2.21	2.24	1.94

Source	DF	SS	MS	F
Between	5	53.31	0.67	2.48
Within	399	1714	4.30	
Total	404	1767		

Combined Forms: Mean total opinion scores ranged from 3.8 (sd=.47) for group 1 (television) to 4.0 (sd=.49) for group 6 (other). The calculated F value was 2.03. The critical value of F (5,399) was 2.26. Therefore, the null hypothesis was accepted. There were no significant differences in mean opinion scores between the six information groups (Table 7).

What was the difference in mean number of words known between respondents citing each of the information sources as their primary source of information about the Great Lakes?

The null hypothesis was there was no difference between the six groups in mean number of words known. The alternate hypothesis was the mean number of words known was not equal for the six groups. The hypothesis was tested at alpha=.05 using one way analysis of variance.

Combined Forms: Mean word scores ranged from 8.6 (sd= 3.01) for group 1 (television) to 10.3 (sd=2.39) for group 3 (magazines). The calculated value of F (5,399) was 4.03. The critical value of F was 2.26 Therefore, the null hypothesis was rejected. A Tukey post hoc analysis was used to investigate differences in mean word scores between the six information groups. At alpha=.05, there was a significant difference in mean word scores between groups 1 and 2 and between groups 1 and 4. Respondents who cited newspapers and those who cited lake and lakeshore activities as their primary source of information about the Great Lakes knew significantly more words than those who cited television (Table 8).

What were the differences between respondents who did and did not watch the broadcast in their mean age, mean education level, mean number of years lived in Cleveland, mean income, and mean number of organizations to which they belong?

The null hypothesis for each variable was no difference in means between respondents who did and did not watch the broadcast. The alternate hypothesis was the means were not equal for respondents who did and did not watch the broadcast. Each hypothesis was tested at alpha=.05 using separate variance estimate t-tests.

TABLE 7
Comparison of Environmental Opinion by Information Source Used — Library Sample, ANOVA
letters represent groups between which there was a significant difference

	TV	Papers	Magazines	Lake	Other	Museum
N	178	114	24	34	28	27
Mean	3.80	3.92	3.96	3.91	4.00	3.99
SD	.47	.40	.53	.44	.49	.57

Source	DF	SS	MS	F
Between	5	2.18	.44	2.03
Within	399	85.42	.21	
Total	404	87.60		

TABLE 8
Comparison of Words known by Information Source Used — Library Sample, ANOVA
letters represent groups between which there was a significant difference

	TV a,b	Papers a	Magazines	Lake b	Other	Museum
N	178	114	24	34	28	27
Mean	8.59	9.82	10.33	10.17	10.00	9.00
SD	3.01	3.03	2.39	1.80	2.80	3.59

Source	DF	SS	MS	F
Between	5	187	37.52	4.36
Within	399	3431	8.60	
Total	404	3619		

Combined Forms: The null hypothesis was rejected for age (alpha=.00) and live (alpha=.00) and accepted for education (alpha=.09), income (alpha=.27), and belong (alpha=.88). There were significant differences in mean age and mean number of years lived in Cleveland between respondents who did and did not watch the broadcast. Respondents who watched the broadcast were significantly older and had lived significantly longer in Cleveland than those who did not watch the broadcast (Table 9).

What was the relationship between whether or not respondents watched the broadcast and their sex, their information source, and the week in which they took the survey?

Combined Forms: The relationship of watch with sex (phi=.06) was negligible. The relationships between watch and information source (Cramer's V=.15) and between watch and week (phi=.10) were low.

What were the differences in information source cited as the primary source of information about the Great Lakes by respondent's age, their education level, number of years they have lived in Cleveland, their income, and number of organizations to which they belong?

The null hypothesis for each variable was no difference in means between the six information source groups. The alternate hypotheses were the means were not equal for the six groups. Each hypothesis was tested at alpha=.05 using one way analysis of variance.

Combined Forms: Mean ages of respondents ranged from 39.9 (sd=18.32) for group 6 (other) to 55.1 (sd=14.31) for group 2 (newspapers). The calculated F value was 4.67. The critical value of F (5,374) was 2.26. Therefore, the null hypothesis was rejected. A Tukey post hoc analysis was used to investigate differences in means between the groups. At alpha=.05, there was a significant difference between group 2 (newspapers) and groups 5 and 6 (museums and other). Those who cited newspapers as their primary source of information were significantly older than those who cited museums or other.

Combined Forms: Mean education levels of respondents ranged from 12.8 years (sd=2.58) for group 1 (television) to 14.5 years (sd=2.96) for group 3 (magazines). The calculated F value was 3.55. The critical value of F (5,384) was 2.26. Therefore, the null hypothesis was rejected. A Tukey post hoc analysis was used to investigate differences in means between the groups. At alpha=.05, there was a significant difference in mean education level between group 2 and group 1. Those who cited newspapers had significantly higher mean education levels than those who cited television.

Combined Forms: The mean number of years respondents have lived in Cleveland ranged from 29.2 (sd=21.20) for group 6 (other) to 45.6 years (sd=19.82) for group 2 (newspapers). The calculated value of F was 3.60. The critical value of F (5,372) was 2.26. Therefore the null hypothesis was rejected. At alpha=.05, there was a significant difference between group 6 and groups 2 and 4. Those who cited newspapers or lake activities have lived significantly longer in Cleveland than those who cited other.

Combined Forms: Mean annual income of respondents ranged from $29,339 (sd=$21,898) for group 1 (television) to $37,950 (sd=$22,688) for group 3 (magazines). The calculated F value was .54. The critical value of F (5,280) was 2.26. Therefore, the null hypothesis was accepted. There were no significant differences in mean annual income between respondents citing each of the six information sources.

Combined Forms: Mean number of organizations to which respondents belong ranged from .11 (sd=.33) for groups 1 (television) to .62 (sd=.70) for group 4 (lake activities). The calculated value of F was 9.19. The critical value of F (5,399) was 2.26. Therefore, the null hypothesis was rejected. A Tukey post hoc analysis was used to investigate differences between groups. At alpha=.05, there were significant differences between group 1 and groups 3, 4, and 5 and between group 2 and groups 3, and 4. Those who cited television belonged to significantly fewer organizations than those who cited magazines, lake activities, or museums. Those who cited newspapers belonged to significantly fewer organizations than those who cited magazines or lake activities.

Combined Forms: The mean number of times respondents viewed the broadcast ranged from 1.2 (sd=2.02) for group 5 (museums) to 2.4 (sd=2.10) for group 4 (lake activities). The calculated value of F was 1.25. The critical value of F (5,399) was 2.26. Therefore, the null hypothesis was accepted. There were no significant differences in the

mean number of times respondents viewed the broadcast for those citing each of the six information groups (Table 10).

What was the relationship between the information source respondents cited as their primary source of information about the Great Lakes and their sex?

Combined Forms: The relationship between information source and respondent's sex (Cramer's V=.10) was low.

What were the relationships within respondents' demographic characteristics: age, years lived in Cleveland, education level, income, number of organizations to which they belong, and number of times they viewed the broadcast?

The relationship between age and live (r=.77) was substantial. The relationship of live and viewed (r=.32) was moderate. There was no correlation between belong and viewed (r=.00). All other correlations were low to negligible: age and education (r=.04), age and income (r=-.17), age and belong (r=-.03), age and viewed (r=.29), live and education ((r=-.13), live and income (r=-.22), live and belong (r=.04), education and income (r=.17), education and belong (r=.15), education and viewed (r=-.14), income and belong (r=.06), and income and viewed (r=-.08) (Table 11).

What were the differences between respondents who belonged to a boating club, civic or community group, environmental interest group, or sport fishing club and those who did not belong to such a group in score on the test, opinion, number of words known, mean number of times they viewed the broadcast, mean age, mean number of years they have lived in Cleveland, mean education level, and mean income?

The null hypothesis for each variable was the means were equal for the two groups. The alternate hypothesis was the means were not equal for respondents who did and did not belong to each group. Each hypothesis was tested at alpha=.05 using separate variance estimate t-tests for independent groups.

TABLE 9
Comparison of Viewer and Nonviewer
Demographics — Library Sample, Combined Forms T-Tests

	Viewers N=171	Nonviewers N=128	Probability
Age	53.48	44.54	.00
Education	13.27	13.80	.09
Live	46.59	34.30	.00
Income	30400	34500	.27
Belong	.26	.27	.88

TABLE 10
Comparison of Information Source Used by
Demographics — Library Sample, ANOVA
letters represent groups between which there was a significant difference

	TV	Papers	Magazines	Lake	Other	Museum
Age	49.4	55.1 a,b	49.0	50.4 a	39.9 b	44.2
Education	12.8 a	14.1 a	14.5	13.5	13.5	14.1
Live	39.6	45.5 a	45.0 b	45.6	29.2 a,b	38.8
Income	29000	34000	38000	32000	37000	34000
Belong	.11 a,b,c,	.23 d,e	.54 a,d	.62 b,e	.32	.41 c

Boating Club: There was a significant difference in education (r=.01) and income (r=.01) between those who did and did not belong to a boating club. Those who belonged to a boating club had significantly higher education levels and significantly higher incomes than those who did not belong to a boating club.

Civic or Community Group: There were significant differences in score on the test (alpha=.04), number of words known (alpha=.02), and education level (alpha=.01) between the two groups. Those who belonged to a civic or community group scored significantly higher on the knowledge items, knew significantly more words, and had significantly higher education levels than those who did not belong to such a group.

Environmental Interest Group: There were significant differences between the two groups in score (alpha=.01), words (alpha=.04), and opinion (alpha=.00). Respondents who belonged to an environmental interest group scored significantly higher on the knowledge items, knew significantly more words, and had significantly higher mean opinion scores than those who did not belong to such a group.

Sport Fishing Club: There was a significant difference in mean opinion scores (alpha=.02) between the two groups. Respondents who belonged to a sport fishing club had significantly higher mean opinion scores than those who did not belong to such a club (Table 12, Table 13).

What was the relationship between whether or not respondents belonged to a boating club, civic or community group, environmental interest group, or sports fishing club and respondents' sex, information source, whether or not they watched the broadcast, week in which they took the survey, site at which they took the survey, and form of the survey?

Boating Club: The relationships between member1 and sex (phi=.03), watch (phi=.03), week (phi=.03), site (phi=.02), and form (Cramer's V=.01) were negligible. The relationship between member1 and information source was moderate (Cramer's V=.31). Respondents who belonged to a boating club tended to cite lake activities more frequently than those who did not belong to a boating club.

Civic or Community Group: There was no relationship between member2 and sex (phi=.00). Relationships between member2 and watch (phi=.02), week (phi=.05),

TABLE 11
Correlations Among Demographic Characteristics of Respondents — Library Sample, Pearson Correlation

	Age	Live	Education	Income	Belong	Viewed
Age	1.00	.77	.04	-.17	-.03	.29
Live		1.00	-.13	-.22	.04	.32
Education			1.00	.17	.15	-.14
Income				1.00	.06	-.08
Belong					1.00	.00
Viewed						1.00

TABLE 12
Comparison of Knowledge Score, Opinion, and Words Known for Members and Nonmembers — Library Sample, Combined Forms T-test

	N	Score	Opinion	Words
Boating				
Members	23	7.26	4.03	9.43
Nonmembers	438	6.69	3.88	9.15
Probability		.29	.23	.67
Civic				
Members	47	7.28	3.86	10.04
Nonmembers	414	6.66	3.89	9.06
Probability		.04	.72	.02
Environmental				
Members	26	7.81	4.16	10.15
Nonmembers	435	6.66	3.87	9.10
Probability		.01	.00	.04
Fishing				
Members	22	6.68	4.13	10.18
Nonmembers	439	6.72	3.87	9.11
Probability		.93	.02	.12

site (phi=.01), and form (Cramer's V=.04) were negligible. The relationship between member2 and information source (Cramer's V=.19), was low.

Environmental Interest Group: Relationships between member3 and sex (phi=.05), watch (phi=.05), week (phi=.06), and form (Cramer's V=.07) were negligible. The relationship between member3 and information source (Cramer's V=.15) and between member3 and site (phi=.10) were low.

Sports Fishing Club: There was no relationship between member4 and site (phi=.00). Relationships between member4 and sex (phi=.08), watch (phi=.03), week (phi=.03), and form (Cramer's V=.05) were negligible. The relationship between member4 and information source was low (Cramer's V=.27). Respondents who belonged to a fishing club tended to cite lake activities more frequently than those who did not belong to a fishing club.

What was the difference in mean scores on broadcast and nonbroadcast knowledge items for respondents who watched all days that the broadcast items were televised?

The null hypothesis was no difference in mean scores between broadcast and nonbroadcast items. The alternate hypothesis was the mean scores were different for broadcast and nonbroadcast items. The hypothesis was tested at alpha=.05 using t-tests for dependent groups.

Form A: The mean score on the broadcast items was 2.7 (sd=1.05) and on the nonbroadcast items was 2.0 (sd=.68). The null hypothesis was rejected (alpha=.00). The mean score of respondents was significantly higher on the broadcast items than on the nonbroadcast items.

Form B: The mean score on the broadcast items was 2.8 (sd=.83) and on the nonbroadcast items was 1.5 (sd=.73). The null hypothesis was rejected (alpha=.00). The mean score of respondents was significantly higher on the broadcast items than on the nonbroadcast ones.

Form C: The mean score of the respondents on the broadcast items was 3.0 (sd=.78) and on the nonbroadcast ones was 2.5 (sd=1.0). The null hypothesis was rejected (alpha=.00). The mean score of respondents was significantly higher on the broadcast

items than on the nonbroadcast items.

Combined Forms: The mean score on the broadcast items was 2.8 (sd=.93) and on the nonbroadcast items was 2.0 (sd=.85). The null hypothesis was rejected (alpha=.00). The mean score of respondents was significantly higher on the broadcast items than on the nonbroadcast items (Table 14).

Mall Results

Was there a difference by site (Randall Park vs. Arcade) in the mean score on the test (score), mean number of words known (words), mean environmental opinion (opinion) , mean age of respondents (age), mean number of years lived in Cleveland (live), mean education level (educ), mean annual income (income), or mean number of organizations to which respondents belong (belong)?

The null hypothesis for each variable was there was no difference in the means between Randall Park and Arcade respondents. The alternate hypothesis for each variable was the means were different between respondents from Randall Park and the Arcade. Each variable was tested with alpha=.05 using separate variance estimate t-tests for independent groups.

Form A: The null hypothesis was rejected for the variables age (alpha=.04) and live (alpha=.04). Respondents at Randall Park were significantly older and had lived in Cleveland significantly longer than respondents from the Arcade. The null hypothesis was accepted for all other variables. There were no significant differences between Randall Park and Arcade respondents in score, words, opinion, education, income, or number of organizations to which respondents belong.

Form B: The null hypothesis was rejected for live (alpha=.03). Respondents at Randall Park had lived in Cleveland significantly longer than respondents at the Arcade. The null hypothesis was accepted for all other variables. There were no significant differences between Randall Park and Arcade respondents in score, words, opinion, education, income, or number of organizations to which respondents belong.

Form C: The null hypothesis was rejected for the variables score and belong. The null hypothesis was accepted for all other variables. Respondents at the Arcade scored

TABLE 13
Comparison of Member and Nonmember
Demographics — Library Sample, Combined Forms T-Test

	Age	Education	Live	Income	Viewed
Boating					
Member	45.5	15.2	40.4	46473	1.65
Nonmember	50.4	13.4	41.8	30917	1.83
Probability	.11	.01	.77	.01	.64
Civic					
Member	51.7	14.6	43.9	33727	2.06
Nonmember	50.0	13.3	41.4	31626	1.79
Probability	.45	.01	.43	.56	.43
Environmental					
Member	49.4	14.4	42.3	30590	1.54
Nonmember	50.2	13.4	41.7	31936	1.84
Probability	.82	.22	.89	.72	.47
Fishing					
Member	47.3	12.9	46.4	31617	1.91
Nonmember	50.3	13.5	41.5	31856	1.82
Probability	.42	.15	.19	.95	.83

TABLE 14
Comparison of Knowledge Scores on Broadcast and
Nonbroadcast Items — Library Sample, T-Test

	N	Mean	SD	DF	Probability
Form A					
Broadcast	63	2.7	1.05	62	.00
Nonbroadcast		2.0	.68		
Form B					
Broadcast	38	2.8	.83	37	.00
Nonbroadcast		1.5	.73		
Form C					
Broadcast	34	3.0	.78	33	.00
Nonbroadcast		2.5	.99		
Combined Forms					
Broadcast	135	2.8	.93	134	.00
Nonbroadcast		2.0	.85		

significantly higher on the knowledge items and belonged to significantly more groups than did respondents at Randall Park. There were no differences between Randall Park and Arcade respondents on words, opinion, education, live, or income.

What was the relationship between site (Randall Park vs. Arcade) and the sex of respondents (sex) and between site and their information source (info)?

Form A: There was a low association between site and information source (Cramer's V=.21) and a negligible association between site and sex (phi=.01).

Form B: There was a low correlation of site with information source (Cramer's V=.16) and a negligible correlation of site with sex (phi=.04).

Form C: The association between site and information source (Cramer's V=.20) was low and between site and sex (phi=.06) was negligible.

What was the difference in mean number of words known, mean age, mean number of years lived in Cleveland, mean education level, mean annual income, and mean number of organizations to which respondents belong among the three groups who took the three forms of the questionnaire (A,B, and C)?

The null hypothesis for all variables was the means for groups A, B, and C were equal. The alternate hypothesis was the means were not equal for the three groups. The hypotheses were tested at alpha=.05 using one way analysis of variance. The null hypothesis was accepted for all variables. There were no significant differences among groups A, B, and C on the variables words, age, live, education, income, or belong.

What was the relationship between the form of the survey (A, B, or C) that respondents took and sex of the respondents and between form and the primary information source cited by the respondent?

The relationships between survey form and sex (phi=.06) and between survey form and information source (Cramer's V=.09) were negligible.

What was the correlation between score on the knowledge test and number of words known, environmental opinion of respondents, their age, number of years

lived in Cleveland, education level, annual income, and number of groups to which they belong?

Form A: There was a moderate correlation between score and words (r=.38) and between score and opinion (r=.34). The correlations between score and age (r=.24), education (r=.23), income (r=.15), and belong (r=.23) were low. There was a negligible correlation between score and live (r=.08).

Form B: There was a substantial correlation between score and opinion (r=.53) and a moderate correlation between score and words (r=.31). Correlations between score and age (r=.29), live (r=.22), and education (r=.22) were low. Correlations between score and income (r=.03) and score and belong (r=-.04) were negligible.

Form C: There were moderate correlations between score and words (r=.44), opinion (r=.39), and education (r=.32). Correlations between score and age (r=.24) and score and live (r=.13) were low. The correlations between score and income (r=-.02) and score and belong (r=.08) were negligible.

Combined Forms: There was a moderate correlation between total knowledge and words known (r=.36) and total knowledge and opinion (r=.35). Correlations between total knowledge and age (r=.26), live (r=.16), and education (r=.25) were low. There were negligible correlations between total knowledge and income (r=.09) and total knowledge and belong (r=.07) (Table 15).

What was the correlation between respondents' environmental opinion and their age, number of years they have lived in Cleveland, education level, income, and number of groups to which they belong?

Form A: Correlations between opinion and words (r=.24), age (r=.16), live (r=.13), and education (r=.16) were low. Correlations between opinion and income (r=-.04) and opinion and belong (r=.07) were negligible.

Form B: The correlation between opinion and words (r=.29), education (r=.41) was moderate. Correlations between opinion and age (r=.20), and live (r=.16) were low. The correlation between opinion and income (r=.06) and opinion and belong (r=.06) were negligible.

Form C: Correlations between opinion and words (r=.22), age (r=.10), education (r=.22), and income (r=-.10) were low. Correlations between opinion and live (r=.08) and opinion and belong (r=.07) were negligible.

Combined Forms: There were low correlations between total opinion and words (r=.25), age (r=.15), live (r=.12), and education (r=.26). The correlation between total opinion and belong (r=.06) was negligible. There was no correlation between total opinion and income (r=.00) (Table 16).

What was the correlation between number of words respondents knew and their age, number of years they have lived in Cleveland, their education level, their annual income, and number of groups to which they belong?

Form A: There were low correlations between the number of words known and age (r=.24), belong (r=.22), live (r=.12) and income (r=.17). The correlations between words and education level (r=.06) was negligible.

Form B: There were low correlations between words and live (r=.18), education (r=.27) and belong (r=.13). Correlations between words and age (r=.08), and words and income (r=-.03) were negligible.

Form C: There were low correlations between words and live (r=.13), education (r=.24), and belong (r=.20). Correlations between words and age (r=.01) and words and income (r=-.05) were negligible.

Combined Forms: There were low correlations between total words known and age (r=.11), live (r=.15), education (r=.19), and belong (r=.19). The correlation between total words and income (r=.03) was negligible (Table 17).

What was the difference in mean score on the test, in mean environmental opinion, and in mean number of words known between male and female respondents?

The null hypothesis was the mean score, mean opinion, and mean number of words known were equal for males and females. The alternate hypothesis was the means were not equal for male and female respondents.

TABLE 15
Correlation of Knowledge Score with Words Known, Opinion, and Demographics — Mall Sample, Pearson Correlation

	Form A	B	C	Combined
Words Known	r = .38	.31	.44	.36
Opinion	r = .34	.53	.39	.35
Age	r = .24	.29	.24	.26
Education	r = .23	.22	.32	.25
Live	r = .08	.22	.13	.16
Income	r = .15	.03	-.02	.09
Belong	r = .23	-.04	.08	.07

TABLE 16
Correlation of Environmental Opinion with Score, Words Known, and Demographics — Mall Sample, Pearson Correlation

	Form A	B	C	Combined
Score	r = .34	.53	.39	.35
Words Known	r = .24	.29	.22	.25
Education	r = .16	.41	.22	.26
Age	r = .16	.20	.10	.15
Live	r = .13	.16	.08	.12
Belong	r = .07	.06	.07	.06
Income	r = -.04	.06	-.10	.00

Form A: Males scored an average of 5.1 (sd=2.0) and females an average of 4.1 (sd=1.83) on the knowledge items. The mean opinion score for males was 4.0 (sd=.56) and for females was 3.9 (sd=.44). The mean number of words known by males was 9.6 (sd=1.19) and by females was 8.0 (sd=2.9). At alpha=.05, the null hypothesis was rejected for score (alpha=.00) and words (alpha=.00) and accepeted for opinion (.46). There were no significant differences between males and females in environmental opinion. Males scored significantly higher than females on the knowledge items and knew significantly more words.

Form B: Males scored an average of 5.4 (sd=2.16) and females an average of 4.8 (sd=1.94) on the knowledge items. The mean opinion score for males was 3.7 (sd=.53) and for females was 3.6 (sd=.62). The mean number of words known by males was 8.8 (sd=3.16) and by females was 7.7 (sd=3.47). At alpha=.05, the null hypothesis was accepted for opinion (alpha=.22) and rejected for score (alpha=.05) and words (alpha=.04). There was no significant difference between males and females in environmental opinion. Males scored significantly higher than females on the knowledge items and knew significantly more words.

Form C: Males scored an average of 6.8 (sd=2.19) on the knowledge items and females an average of 5.5 (sd=2.15). The mean opinion score for males was 3.7 (sd=.42) and for females was 3.7 (sd=.45). The mean number of words known by males was 9.2 (sd=3.17) and by females was 8.0 (sd=3.13). At alpha=.05, the null hypothesis was rejected for score (alpha=.00) and words (alpha=.02) and accepted for opinion (alpha=.33). There were no significant differences between males and females in environmental opinion. Males scored significantly higher on the knowledge items and knew significantly more words than did females.

Combined Forms: Males scored an average of 5.8 (sd=2.25) on the knowledge items, 3.8 (sd=.52) on the opinion items, and 9.2 (sd=3.18) on the number of words known. Females scored a mean of 4.8 (sd=2.04) on the knowledge items, 3.7 (sd=.54) on the opinion items, and 7.9 (sd=3.19) on the number of words known. The null hypothesis was accepted for total opinion (alpha=.08) and rejected for total knowledge (alpha=.00) and words (alpha=.00). There was no significant difference between males and females

on the opinion items. Males scored significantly higher on the knowledge items on the test and knew significantly more words than did females (Table 18).

What was the difference in mean knowledge score on the test between respondents citing each of the information sources as their primary source of information about the Great Lakes?

The null hypothesis was the mean scores on the knowledge test were equal for the six information source groups. The alternate hypothesis was the mean scores of the six groups were not equal. The hypothesis was tested at alpha=.05 using one way analysis of variance.

Form A: Mean scores ranged from 4.4 (sd=1.80) for group 1 (television) to 5.6 (sd=2.87) for group 6 (other). The calculated F value was 1.16. The critical value of F (5,154) was 2.29. Therefore, the null hypothesis was accepted. There were no significant differences in mean knowledge scores between the six information groups.

Form B: Mean scores on the knowledge test ranged from 4.3 (sd=2.16) for group 3 (magazines) to 6.5 (sd=3.73) for group 4 (lake activities). The calculated value of F was 2.12. The critical value of F (5,160) was 2.29. Therefore, the null hypothesis was accepted. There were no significant differences in mean knowledge scores on the test between the six information groups.

Form C: Means ranged from 5.7 (sd=2.26) for group 1 (television) to 7.8 (sd=2.50) for group 4 (lake activities). The calculated F value was 2.96. The critical value of F (5,152) was 2.29. Therefore, the null hypothesis was rejected. A Tukey post hoc analysis was used to investigate differences in means between the six groups. At alpha=.05, there was a significant difference between group 1 (television) and group 2 (newspapers). Those who cited newspapers as their primary information source scored significantly higher than those who cited television.

Combined Forms: Mean total knowledge scores ranged from 5.0 (sd=2.36) for group 3 (magazines) to 6.2 (sd=2.27) for group 6 (other). The calculated F value was 3.9. The critical value of F (5,478) was 2.26. Therefore, the null hypothesis was rejected. A Tukey post hoc analysis was used to investigate differences in means between the six information groups. At alpha=.05, there was a significant difference between group 1

TABLE 17
Correlation of Words Known with Knowledge Score, Opinion, and Demographics — Mall Sample, Pearson Correlation

	Form A	B	C	Combined
Score	r = .38	.31	.44	.38
Opinion	r = .24	.29	.22	.25
Education	r = .06	.27	.24	.19
Belong	r = .22	.13	.20	.19
Live	r = .12	.18	.13	.15
Age	r = .24	.08	.01	.11
Income	r = .17	-.03	-.05	.03

TABLE 18
Comparison of Score, Opinion, and Words by Sex — Mall Sample, Combined Forms T-Test

	N	Mean	SD	DF	Probability
Score					
Male	282	5.8	2.25	495	.00
Female	222	4.8	2.04		
Opinion					
Male	282	3.8	.52	465	.08
Female	221	3.7	.54		
Words					
Male	282	9.2	3.18	478	.00
Female	224	7.9	3.19		

(television) and group 2 (newspapers) and between group 1 (television) and group 6 (other). Respondents who cited newspapers or other as their primary source of information about the Great Lakes scored significantly higher on the knowledge items on the test than those who cited television (Table 19).

What was the difference in mean environmental opinion between the respondents citing each of the information sources as their primary source of information about the Great Lakes?

The null hypothesis was the mean opinion scores for the six groups were equal. The alternate hypothesis was the the mean opinion scores were not equal for the six groups. The hypothesis was tested at alpha=.05 using one way analysis of variance.

Form A: Mean opinion scores ranged from 3.88 (sd=.66) for group 4 (lake activities) to 3.97 (sd=.41) for group 6 (other). The calculated F value was .11. The critical value of F (5,154) was 2.29. Therefore, the null hypothesis was accepted. There were no significant differences in mean opinion scores between the six information groups.

Form B: Mean opinion scores ranged from 3.1 (sd=.23) for group 5 (museums) to 4.1 (sd=.40) for group 6 (other). The F calculated was 2.68. The critical F value (5,160) was 2.29. Therefore, the null hypothesis was rejected. A Tukey post hoc analysis was used to investigate differences between the six groups. At alpha=.05, group 1 differed significantly from group 6. Those who cited other information sources had significantly higher mean environmental opinions than those who cited television as their primary information source.

Form C: Mean opinion scores ranged from 3.5 (sd=.56) for group 6 (other) to 3.8 (sd=.37) for group 3 (magazines). The calculated F value was .62. The critical value of F (5,150) was 2.29. Therefore, the null hypothesis was accepted. There were no significant differences in mean opinion scores between the six information groups.

Combined Forms: Mean opinion scores ranged from 3.6 (sd=.47) for group 5 (museums) to 3.9 (sd=.49) for group 6 (other). The calculated value of F was 1.05. The critical F value (5,475) was 2.26. Therefore, the null hypothesis was accepted. There

were no significant differences in mean opinion scores between the six information groups (Table 20).

What was the difference in mean number of words known between respondents citing each of the information sources as their primary source of information about the Great Lakes?

The null hypothesis was there was no difference between the six information groups in mean number of words known. The alternate hypothesis was the mean number of words known was not equal for the six groups. The hypothesis was tested at alpha=.05 using one way analysis of variance.

Combined Forms: Mean word scores ranged from 8.0 (sd=3.17) for group 1 (television) to 10.1 (sd=3.31) for group 4 (lake activities). The calculated F value was 4.01. The critical value of F (5,478) was 2.26. Therefore, the null hypothesis was rejected. A Tukey post hoc analysis was used to investigate differences in means between the six groups. At alpha=.05, there was a significant difference in mean word scores between groups 1 (television) and 2 (newspapers). Respondents who cited newspapers as their primary source of information about the Great Lakes knew significantly more words than those who cited television (Table 21).

What were the differences in information source cited as the primary source of information about the Great Lakes by respondents' age, their education level, number of years they have lived in Cleveland, their income, and number of organizations to which they belong?

The null hypothesis for each variable was no difference in means between the six information source groups. The alternate hypotheses were the means were not equal for the six groups. Each hypothesis was tested at alpha=.05 using one way analysis of variance.

Combined Forms: Mean ages of respondents ranged from 27.6 years (sd=13.16) for group 6 (other) to 38.0 (sd=16.39) for group 2 (newspapers). The calculated value of F was 3.43. The critical value of F (5,453) was 2.26. Therefore, the null hypothesis was rejected. A Tukey post hoc analysis was used to investigate differences in means

TABLE 19
Comparison of Knowledge Score by Information Source Used — Mall Sample, ANOVA
letters represent groups between which there was a significant difference

	TV a,b	Papers a	Magazines	Lake	Other b	Museum
N	268	122	26	20	36	12
Mean	5.01	5.76	4.96	6.25	6.16	5.33
SD	.13	.21	.46	.58	.38	.75

Source	DF	SS	MS	F
Between	5	94.95	18.99	3.91
Within	478	2324	4.86	
Total	483	2419		

TABLE 20
Comparison of Environmental Opinion by Information Source Used — Mall Sample, ANOVA
letters represent groups between which there was a significant difference

	TV	Papers	Magazines	Lake	Other	Museum
N	266	122	26	20	35	12
Mean	3.71	3.77	3.76	3.73	3.90	3.62
SD	.51	.58	.58	.57	.49	.47

Source	DF	SS	MS	F
Between	5	1.50	.30	1.05
Within	475	135	.28	
Total	480	137		

between the six groups. At alpha=.05, there was a significant difference in mean ages between group 2 and groups 1 and 6. Those who cited newspapers as their primary source of information were significantly older than those who cited television or other.

Combined Forms: Mean education levels of respondents ranged from 12.7 years (sd=2.67) for group 4 (lake activities) to 14.3 years (sd=4.68) for group 5 (museums). The calculated F value was 2.75. The critical F value (5,457) was 2.26. Therefore, the null hypothesis was rejected. A Tukey post hoc analysis was used to investigate differences in means between the six groups. At alpha=.05, there was a significant difference between group 2 and groups 1 and 6. Respondents who cited newspapers as their primary information source had significantly higher mean education levels than those who cited television or other.

Combined Forms: Mean number of years respondents had lived in Cleveland ranged from 16.13 (sd=19.39) for group 3 (magazines) to 19.8 years (sd=18.06) for group 5 (museums). The calculated F value was 2.12. The critical value of F (5,444) was 2.26. Therefore, the null hypothesis was accepted. There were no significant differences in mean number of years respondents have lived in Cleveland between those citing each of the six information sources.

Combined Forms: Mean annual incomes ranged from $32,131 (sd=$14,600) for group 3 (magazines) to $46,307 (sd=$22,362) for group 4 (lake activities). The calculated F value was 1.12. The critical value of F (5,346) was 2.29. Therefore, the null hypothesis was accepted. There were no significant differences in mean annual incomes between respondents citing each of the six information sources.

Combined Forms: Mean number of organizations to which respondents belong ranged from .17 (sd=.46) for group 1 (television) to .65 (sd=1.04) for group 4 (lake activities). The calculated value of F was 4.74. The critical value of F (5,478) was 2.26. Therefore, the null hypothesis was rejected. A Tukey post hoc analysis was used to investigate differences in means between the six information groups. At alpha=.05, there was a significant difference between group 4 and group 1. Respondents who cited lake activities belonged to significantly more organizations than respondents who cited television as their primary source of information (Table 22).

TABLE 21
Comparison of Words Known by Information Source Used — Mall Sample, ANOVA
letters represent groups between which there was a significant difference

	TV	Papers	Magazines	Lake	Other	Museum
	a	a				
N	268	122	26	20	36	12
Mean	7.99	9.20	9.15	10.01	8.78	9.75
SD	3.17	3.30	3.00	3.31	3.97	2.78

Source	DF	SS	MS	F
Between	5	214	42.90	4.03
Within	478	5079	10.63	
Total	483	5294		

TABLE 22
Comparison of Information Source Used by Demographics — Mall Sample, ANOVA
letters represent groups between which there was a significant difference

	TV	Papers	Magazines	Lake	Other	Museum
Age	32.4	38.0	32.9	31.6	27.6	32.8
	a	a,b			b	
Education	13.1	14.4	13.7	12.7	13.3	14.3
	a	a,b			b	
Live	19.5	24.7	16.1	23.8	17.9	19.8
Income	36000	40000	32000	46000	43000	42000
Belong	.17	.33	.34	.65	.33	.58
	a	a				

What was the relationship between information source cited as the primary source of Great Lakes information and the sex of the respondent?

Combined Forms: The relationship between information source and sex was low (Cramer's V=.11).

What were the relationships within respondents' demographic characteristics: age, years lived in Cleveland, education level, income, and number of organizations to which they belong?

Combined Forms: The relationship of age with live (r=.58) was substantial. There was no relationship between live and education (r=.00). All other relationships were low or negligible: age and education (r=.18), age and income (r=-.04), age and belong (r=.02), live and income (r=-.13), live and belong (r=-.04), . education and income (r=.12), education and belong (r=.03), and income and belong (r=.16) (Table 23).

What were the differences between respondents who belonged to a boating club, civic or community group, environmental interest group, or sport fishing club and those who did not belong to such a group in score on the test, mean environmental opinion, mean number of words known, mean age, mean number of years they have lived in Cleveland, mean education level, and mean income?

The null hypothesis for each variable was the means were equal for respondents who did and did not belong to each group. The alternate hypothesis was the means were not equal for respondents who did and did not belong to each group. Each hypothesis was tested at alpha=.05 using separate variance estimate t-tests for independent groups.

Boating Club: There were significant differences in score (r=.04) and words (alpha=.00) between the two groups. Those who belonged to a boating club scored significantly higher on the knowledge items and knew significantly more words than those who did not belong to a boating club.

Civic or Community Group: There were significant differences in the number of words known (alpha=.04) and in annual income (alpha=.03) between the two groups. Respondents who belonged to a civic or community group knew significantly more words and had significantly higher education levels than those who did not belong to such a group.

Environmental Interest Group: There were significant differences in mean opinion (alpha=.00), mean number of words known (alpha=.00), and in mean education level (alpha=.03) between the two groups. Respondents who belonged to an environmental interest group had significantly higher opinion scores, knew significantly more words, and had significantly higher incomes than those who did not belong to such a group.

Sports Fishing Club: There was a significant difference in mean number of years lived in Cleveland between the two groups (alpha=.05). Respondents who did not belong to a sports fishing club had lived in Cleveland significantly longer than respondents who belonged to a sports fishing club (Table 24, Table 25).

What was the relationship between whether or not respondents belonged to a boating club, civic or community group, environmental interest group, or sports fishing club and respondents' sex, information source, site at which they took the survey, and form of the survey?

Boating Club: The relationships between member1 and sex (phi=.04), site (phi=.01), and form (Cramer's V=.02) were negligible. The relationship between member1 and information source was low (Cramer's V=.20).

Civic or Community Group: Relationships between member 2 and sex (phi=.11) and information source (Cramer's V=.13) were low. The relationship between member2 and site (phi=.05), and form (Cramer's V=.08) were negligible.

Environmental Interest Group: Relationships between member3 and sex (phi=.01), site (phi=.02), and form (Cramer's V=.05) were negligible. The relationship between member3 and information source (Cramer's V=.20) was low.

Sports Fishing Club: Relationships between member4 and sex (phi=.05), site (phi=.03), and form (Cramer's V=.05) were negligible. The relationship between member4 and information source was low (Cramer's V=.17).

What was the difference in mean scores on broadcast and nonbroadcast knowledge items for mail respondents?

The null hypothesis was there was no difference in mean scores on the broadcast and nonbroadcast items. The alternate hypothesis was the means on broadcast items and

TABLE 23
Correlations Among Demographic Characteristics of Respondents — Mall Sample, Pearson Correlation

	Age	Live	Education	Income	Belong
Age	1.00	.58	.18	-.04	.02
Live		1.00	.00	-.13	-.04
Education			1.00	.12	.03
Income				1.00	.16
Belong					1.00

TABLE 24
Comparison of Knowledge Score, Opinion, and Words Known for Members and Nonmembers — Mall Sample, Combined Forms T-test

	N	Score	Opinion	Words
Boating				
Members	30	6.07	3.87	10.23
Nonmembers	540	5.19	3.73	7.76
Probability		.04	.17	.00
Civic				
Members	49	5.45	3.77	8.96
Nonmembers	521	5.22	3.73	7.80
Probability		.51	.68	.04
Environmental				
Members	37	5.92	4.00	10.08
Nonmembers	533	5.19	3.72	7.74
Probability		.14	.00	.00
Fishing				
Members	25	4.76	3.55	8.88
Nonmembers	545	5.26	3.75	7.85
Probability		.37	.18	.19

nonbroadcast items were different. The hypothesis was tested at alpha=.05 using t-tests for dependent groups.

Form A: The mean score on broadcast items was 1.4 (sd=.94) and on nonbroadcast items was 1.6 (sd=.78). The null hypothesis was rejected (alpha=.02). The mean score on nonbroadcast items was significantly higher than the mean score on the broadcast items.

Form B: The mean score on broadcast items was 2.1 (sd=1.06) and on nonbroadcast items was 1.5 (sd=.78). The null hypothesis was rejected (alpha=.00). The mean score on broadcast items was significantly higher than the mean score on nonbroadcast items.

Form C: The mean score for broadcast items was 1.8 (sd=1.00) and for nonbroadcast items was 2.1 (sd=.92). The null hypothesis was rejected (alpha=.00). The mean score for nonbroadcast items was significantly higher than the mean score for broadcast items.

Combined Forms: The mean score for broadcast items was 1.8 (sd=1.04) and for nonbroadcast items was 1.7 (sd=.88). The null hypothesis was accepted (alpha=.16). There was no significant difference between mean scores on broadcast and nonbroadcast items (Table 26).

Library versus Mall Respondents

What were the differences between the mall and library respondents in mean score on the test, mean score on the broadcast items, mean score on the nonbroadcast items, mean environmental opinion, mean number of words known, mean age, mean number of years lived in Cleveland, mean education level, mean annual income, and mean number of organizations to which they belonged?

The null hypotheses were no differences in the means for each variable between the mall and library sample populations. The alternate hypothesis were the means were not equal for the two groups for each variable. Each hypothesis was tested at alpha=.05 using separate variance estimate t-tests for independent groups.

TABLE 25
Comparison of Member and Nonmember
Demographics — Mall Sample, Combined Forms T-Test

	Age	Education	Live	Income
Boating				
Member	30.0	13.3	18.9	52000
Nonmember	33.6	13.5	21.1	37000
Probability	.25	.77	.46	.08
Civic				
Member	36.9	14.0	20.7	47000
Nonmember	33.1	13.4	21.0	37000
Probability	.08	.30	.94	.03
Environmental				
Member	33.2	14.7	22.3	43000
Nonmember	33.4	13.4	20.9	38000
Probability	.92	.03	.68	.26
Fishing				
Member	35.3	12.0	14.0	44000
Nonmember	33.3	13.5	21.3	38000
Probability	.56	.09	.05	.15

TABLE 26
Comparison of Knowledge Scores on Broadcast and
Nonbroadcast Items — Mall Sample, T-Test

	N	Mean	SD	DF	Probability
Form A					
Broadcast	186	1.4	.94	185	.02
Nonbroadcast		1.6	.78		
Form B					
Broadcast	191	2.1	1.06	190	.00
Nonbroadcast		1.5	.78		
Form C					
Broadcast	193	1.8	1.00	192	.00
Nonbroadcast		2.1	.92		
Combined Forms					
Broadcast	570	1.8	1.04	569	.16
Nonbroadcast		1.7	.88		

The null hypothesis was rejected for all variables (alpha=.00) except education (alpha=.99), and belong (alpha=.80). There were no significant differences between the library and mall sample populations in education level, or number of groups to which respondents' belong. There were significant differences between the library and mall sample populations in mean score on the knowledge test, mean score on broadcast items, mean score on nonbroadcast items, mean environmental opinion, mean number of words known, mean age, mean number of years respondents have lived in Cleveland, and mean income. Library respondents scored significantly higher than mall respondents on the knowledge test, broadcast items, nonbroadcast items, environmental opinion, and number of words known, were significantly older, and had lived in Cleveland significantly longer. Mall respondents had significantly higher incomes than library respondents.

What was the relationship between whether respondents participated in the mail or library survey and the primary information source used, respondents' sex, and whether or not they belonged to a fishing, boating, civic, or environmental group?

The relationship between sample population (library or mall) and information source was low. The relationships between sample population and sex (phi=.08), boating club (phi=.01), civic group (phi=.03), environmental group (phi=.02), and fishing club (phi=.01) were negligible.

What was the relationship between respondents' indication of their understanding of specific environmental terms and their score on related knowledge item questions?

Library Sample: On form C, there was a moderate correlation between question 12 concerning the ecosystem approach to Great Lakes management and the terms "ecosystem" and "ecosystem management." All other correlations between terms and related knowledge questions were low to negligible.

Mall Sample: For all three forms, all correlations between terms and related knowledge items were low to negligible (Table 27).

TABLE 27

Correlation of Understanding of Words and Score on Related Knowledge Items — Library and Mall Samples, Pearson Correlation

Negligible to low correlations (phi ≤ .29) between:
toxic --- toxics in Lake Michigan
phosphorus (phosphate) --- phosphate levels in the Great Lakes
lake level regulation --- lake level changes
diversion --- lake level changes
eutrophication --- nutrient flow into the Great Lakes
fish advisory --- reducing fish contaminants
pesticide --- DDT in the Great Lakes
diversion --- diversion of Great Lakes water
eutrophication ---eutrophication means ...
fish advisory --- carp consumption warnings
estuary --- estuary protection
nutrient --- nutrients and algae blooms
erosion --- shoreline erosion

Summary Library Results

County residents tended to score higher on the knowledge test, have higher opinion scores, higher education levels, and higher annual incomes than city respondents, and to cite newspapers more often as their primary source of Great Lakes information than did city respondents, although these differences were not consistent across the three forms or over the two weeks. County and city respondents did not differ in number of words known, age, years lived in Cleveland, number of organizations to which they belonged, or number of times they viewed the broadcast. There were low to negligible correlations between site and respondents' sex, information source, whether or not they watched the broadcast, and whether or not they belonged to a civic, environmental, boating, or fishing group.

On form B, respondents from week one scored significantly higher on the knowledge items than respondents from week two. For all other variables on form B, and for all variables on forms A and C — environmental opinion, number of words known, age, years lived in Cleveland, number of times respondents viewed the broadcast, or number of organizations to which they belonged — there were no differences between respondents from week one and week two. Relationships between week and respondents' sex, information source, whether or not they watched the broadcast, and whether or not they belonged to a fishing, boating, environmental, or civic group were low.

Respondents who took survey form B were significantly older than respondents who took form C. Group A knew significantly more words than did group C. Otherwise, for those taking the three forms of the survey there were no significant differences in number of words known, age, years lived in Cleveland, number of times respondents viewed the broadcast, or number of organizations to which respondents belonged. Relationships between form and respondents' sex, information source, whether or not they watched the broadcast, and whether or not they belonged to a civic, environmental, fishing, or boating group were low.

The relationships between score on the knowledge test and number of words known were moderate to substantial. After number of words known, score was most highly correlated with education level and opinion. Opinion was most strongly correlated with

score on the knowledge test, followed by number of words known and education level. The number of words respondents knew most strongly correlated with score on the test, opinion, and education. Relationships between score, opinion, and words and age, income, years lived in Cleveland, number of days respondents viewed the broadcast, and number of organizations to which they belong were low or negligible.

Male respondents scored significantly higher than females on the knowledge items on the test and knew significantly more words. Males and females did not differ on environmental opinion.

Respondents who did and did not watch the survey did not differ significantly in their scores on the knowledge items or in the mean number of words they knew. Respondents who watched the broadcast had significantly higher mean opinion scores, were significantly older and had lived significantly longer in Cleveland than those who did not watch the broadcast. Respondents did not differ in education level, income, or number of organizations to which they belonged. The relationships between whether respondents watched the broadcast and their sex, information source, and whether or not they belonged to a fishing, boating, civic, or environmental group were low to negligible.

Respondents who cited lake and lakeshore activities scored significantly higher on the knowledge items than those who cited television. Respondents who cited newspapers or lake and lakeshore activities knew significantly more words than those who cited television. There were no significant differences in mean opinion scores among the six information source groups.

Respondents who cited newspapers as their primary source of information were significantly older than those who cited museums or "other" and had significantly higher mean education levels than those who cited television. Respondents who cited newspapers or lake activities had lived in Cleveland significantly longer than those who cited "other." There were no significant differences in mean annual income or number of days respondents viewed the broadcast among the six groups. Respondents who cited television belonged to significantly fewer organizations than those who cited magazines, lake activities, or museums. Respondents who cited newspapers belonged to significantly fewer organizations than those who cited magazines or lake activities. The relationship between information source and sex was low.

The relationship between respondents' age and the number of years they have lived in Cleveland was substantial. The relationship between years lived in Cleveland and number of times respondents viewed the broadcast was moderate. There was no correlation between number of groups to which respondents belonged and number of times they viewed the broadcast. All other correlations among age, years lived in Cleveland, education level, income, number of organizations to which respondents belonged, and number of times they viewed the broadcast were low to negligible.

Respondents who belonged to a boating club had significantly higher education levels and incomes than those who did not belong to a boating club. Those in a civic or community group scored significantly higher on the knowledge items, knew significantly more words, and had significantly higher education levels than those who did not belong to such a group. Respondents who belonged to an environmental group scored significantly higher on the knowledge items, knew significantly more words, and had significantly higher opinion scores than those who did not belong to such a group. Those in a fishing club had significantly higher opinion scores than those who did not belong to a fishing club. Otherwise, members and nonmembers of civic, boating, fishing, and environmental groups did not differ in knowledge score, opinion, number of words known, number of times they viewed the broadcast, age, years lived in Cleveland, income, or education level.

Respondents who belonged to fishing and boating clubs tended to cite lake activities as their primary source of information more often than those who did not belong to a fishing or boating club. Otherwise, relationships between whether or not respondents belonged to a boating, fishing, civic, or environmental group and their sex and information source were low to negligible.

Relationships between respondents' indication of whether or not they understood a specific environmental term and their score on related knowledge items were low to negligible on all three forms.

Respondents' mean scores on broadcast items were significantly higher than for non-broadcast items for all three forms and with the three forms combined.

Summary Mall Results

Respondents from Randall Park were older and had lived in Cleveland longer than respondents from The Arcade. On form C, Arcade respondents scored higher and belonged to more groups than Randall Park respondents. Otherwise, there were no differences between Randall Park and Arcade respondents in knowledge score, number of words known, opinion, number of organizations to which respondents belonged, education level, or income. The associations between site and respondent's sex, whether or not they belonged to a boating, fishing, civic, or environmental group, and information source were low.

There were no differences between respondents who took forms A, B, and C of the survey in number of words known, age, years lived in Cleveland, education level, income, or number of organizations to which respondents belonged. The relationships between form and respondent's sex, whether or not they belonged to a boating, fishing, civic, or environmental group, and information source were negligible.

Score on the knowledge items was most strongly correlated with words known and environmental opinion. Relationships between score and age, years lived in Cleveland, education level, income, and number of groups belonged to were low to negligible.

Environmental opinion was most highly correlated with knowledge score, with education, and with number of words known. Relationships with age, years lived in Cleveland, number of organizations belonged to, and income were low to negligible.

Number of words known was most highly correlated with score and opinion. Correlations of words known with age, years lived in Cleveland, education, income, and number of groups belonged to were low to negligible.

Males scored significantly higher on the knowledge items and knew significantly more words than did females, but there was no difference between males and females in environmental opinion.

Respondents who cited newspapers or "other" as their primary source of information about the Great Lakes scored significantly higher on the knowledge items than those who cited television. There were no significant differences in knowledge scores among any of the other information source groups. There were no significant differences in mean opinion scores among the six information source groups. Respondents who cited newspapers as their primary source of Great Lakes information knew significantly more words

than those who cited television. There were no significant differences in number of words known among the other information source groups.

Respondents who cited newspapers as their primary information source were significantly older and had significantly higher mean education levels than those who cited television or other. Respondents who cited lake activities as their primary information source belonged to significantly more organizations than those who cited television. There were no significant differences among the six information source groups in mean number of years respondents have lived in Cleveland or mean annual income. Relationships between information source and sex were low.

The relationship of respondent's age and number of years lived in Cleveland was substantial. There was no relationship between years lived in Cleveland and education level. All other relationships among age, years lived in Cleveland, education level, income, number of organizations to which respondents belong, and number of times they viewed the broadcast were low to negligible.

Respondents who belonged to a boating club scored significantly higher than nonmembers on the knowledge items and knew significantly more words. Those who belonged to a civic or community group knew significantly more words and had significantly higher education levels than those who did not belong to such a group. Respondents who belonged to an environmental group had significantly higher opinion scores, knew significantly more words, and had significantly higher education levels than those who did not belong to an environmental group. Respondents who belonged to a fishing club had lived in Cleveland significantly longer than those who did not belong to such a club, otherwise there were no differences between members and nonmembers of fishing, boating, civic, or environmental organizations and mean age, education, income, and years lived in Cleveland. Relationships between whether or not respondents belonged to a fishing, boating, civic, or environmental group and respondents' sex and information source were low or negligible.

Relationships between respondents' indication of whether or not they understood specific environmental terms and their score on related knowledge item questions were low to negligible on all three forms of the survey.

On forms A and C, the mean score on the nonbroadcast items was significantly higher than the mean score on the broadcast items. On form B, the mean score on the broadcast items was significantly higher than the mean score on the nonbroadcast items. Combining scores from all three forms of the survey, there was no significant difference in mean scores on broadcast and nonbroadcast items.

Summary Library versus Mall Respondents

There were no significant differences between the library and mall respondents in education level, and number of organizations to which they belonged. Library respondents scored significantly higher than mall respondents on the knowledge test, broadcast items, nonbroadcast items, environmental opinion, and number of words known, were significantly older, and had lived in Cleveland significantly longer. Mall respondents had significantly higher incomes than library respondents. The relationships between whether respondents were in the library or mall sample populations and respondents' information source, sex, and whether or not they belonged to a fishing, sporting, civic, or environmental group were low.

CHAPTER V

Conclusions and Discussion

The purpose of this study was to collect baseline information about public knowledge of and opinions toward the Great Lakes and to measure the impact of a television news program in educating adults about the Great Lakes. This discussion will address the findings of the study, make recommendations for further research, and discuss the implications of this research for public education about the Great Lakes.

Conclusions

1) Public knowledge concerning the environmental issues and natural resources of the Great Lakes is low. Mean knowledge scores for the mall and library populations studied were 44% and 56% respectively. Only 17% of mall respondents and 37% of library respondents could answer 65% or more of the knowledge questions correctly.

2) Despite low knowledge levels, respondents held generally positive environmental opinions about the Lakes. Mall and library respondents responded similarly to the environmental opinion statements, although library respondents scored higher on the opinion scale than did mall respondents.

3) Environmental knowledge and opinion were positively correlated. Education was the demographic characteristic mostly highly and most consistently correlated with environmental knowledge and opinion.

4) Television, followed by newspapers, were the primary sources of Great Lakes information for most respondents. Respondents who cited newspapers or lake activities as their primary information source were more knowledgeable than those who cited television, however, environmental opinion did not differ by information source.

5) A television news program broadcast of environmental information concerning the Great Lakes was effective in increasing public knowledge of environmental issues and natural resources related to the Great Lakes.

Great Lakes Knowledge

The baseline mall study indicated that public knowledge about the resources of and issues facing the Great Lakes is generally low. The mean knowledge score for the mall sample combining the three forms of the survey was 5.24 out of 12 questions, or 43.6%. Only 17% of the respondents could answer 8 or more questions correctly, representing a score of 66% or higher on the multiple choice questions. Respondents also indicated that they understood a mean of 7.90 of the 14, or 56.4%, of the environmental terms presented. Mean total knowledge score of the library respondents was significantly higher than that of the mall respondents. The mean knowledge score for the library respondents was 6.72, or 56%, and 36.9% answered 8 or more questions correctly. The mean number of words known by library respondents was also significantly higher than for mall respondents. Library respondents indicated they understood a mean of 9.16, or 65.4%, of the environmental terms.

The higher knowledge and word scores of the library respondents likely resulted from several factors. First, 52.5% of the library respondents had watched at least one day of the broadcast, thus they had already been exposed to some of the information on the survey when they went to the library to take it. Second, it is likely that because library respondents made the effort to go to the library to take the survey as a result of hearing about it during the broadcast, they represent a group of people who were more knowledgeable about and interested in the Great Lakes than the general public. Thus, their level of knowledge even before they watched the survey may have been higher than that of respondents from the mall survey.

Finally, some of the library respondents may have been visiting the library for reasons other than taking the survey, have seen the posters announcing the survey, and decided to complete the questionnaire. Although these people did not see the broadcast, nor did they make a special effort to go to the library to take the survey, they were interested enough to complete the survey while they were at the library. While the means for

nonviewer library respondents on the knowledge, word, and opinion scales were lower than those of viewers, they were higher than for mall respondents. Thus, even library respondents who did not view the broadcast may represent a more informed group than the general public or the mall respondents. Library respondents who did not watch the broadcast were older and had lived in Cleveland longer than those who had watched the broadcast, otherwise these two groups did not differ in demographic characteristics.

There were some differences between the mall and library respondents in demographic characteristics. Although the two groups did not differ in education level, number of organizations to which they belonged, membership in fishing, sporting, civic, or environmental groups, information source about the Great Lakes, or numbers of male and female respondents, the library sample was significantly older and had lived in Cleveland longer while the mall sample had significantly higher annual incomes. However, the relationships of knowledge score and words known with age, years lived in Cleveland, and income were generally low, thus differences in these demographic characteristics between the two groups may not explain differences in knowledge and word scores. The demographic characteristic which most highly and most consistently correlated with knowledge score and words known was education, yet the two groups did not differ significantly in education level.

Knowledge score was consistently and most highly correlated with number of words known. This is not too surprising as the multiple choice knowledge questions and the environmental term checklist are both measures of what people know about the Great Lakes. The environmental term checklist is a more subjective measure because respondents are asked to indicate what they think they know rather than to demonstrate what they actually know. Respondents may think they know what a word means when they actually do not, or they may be unwilling to indicate that they do not understand a term. Correlations between respondents' indication of whether or not they understood specific terms and whether or not they correctly answered knowledge questions using those terms were low. This may indicate that respondents were able to understand and respond to questions correctly even if they did not understand all the words used in the questions. It may also indicate that even if respondents understand the terms, or think they understand them, they are unable to answer questions using those terms.

Only the mall results concerning knowledge on specific survey questions will be discussed here as the library results do not truly indicate what the general public knows, but rather, as discussed earlier, what an informed group knows. The primary purpose of the pilot mall study was to establish this baseline information concerning public knowledge of the Great Lakes using a sample population believed to be representative of the general public in Cleveland, Ohio. The library respondents were not used to establish this baseline because they were considered to be less representative of the general public. The frequencies for knowledge questions for both mall and library surveys are presented in Appendix G. In the following discussion, it is important to note that because there were four choices for each multiple choice question, by probability, 25% of respondents could possibly get each question correct, even if all the respondents were guessing on that question.

Most respondents knew the cheapest way to transport iron ore is by boat (76%), that the main products shipped on the Great Lakes are iron ore, grain, and coal (81%), and that natural gas and salt deposits are found under Lake Erie (69%). Only 16% recognized the fruit industry as resulting from the lake's influence on climate.

Most respondents knew that estuaries serve as breeding grounds for fish and wildlife (76%), but fewer knew that some fish have become endangered because their spawning grounds have been destroyed (60%), and that marshes have been disappearing because people have drained and filled them (42%). Approximately 60% of respondents indicated they did not understand the term estuary. About 53% of respondents knew that the sea lamprey is a parasite on trout and other fish. Some 67% of respondents recognized carp as a fish people have been warned not to eat. This is consistent with 65% of respondents indicating they understood the term fish advisory. However, only 44% knew the best way to prepare fish to reduce contaminants is to cut away the fat and broil, and still fewer knew that eating fish is the most likely way people are exposed to hazardous chemicals in the Great Lakes (37%). Only about half the respondents knew that Lake Erie produces more fish for human food than all the other Great Lakes combined.

While nearly 70% of respondents recognized phosphorus as the chemical nutrient causing algae blooms in the Great Lakes, fewer knew that nutrient flows into the Lakes cause an increase in algae blooms (55%), that eutrophication means the aging of a body

of water (45%), that the major source of phosphorus in the Lakes is agricultural runoff (17%), and that phosphorus has been reduced a lot in the last 15 years (16%). These results are consistent with 80% of respondents indicating they understood the term phosphorus, and 87% indicating they understood the term nutrient, while 88% indicated they did not understand the term eutrophication.

Respondents seemed not to recognize air pollution as a source of toxic chemicals as only 10% knew that most toxic chemicals in Lake Superior get there from air pollution and only 11% knew that DDT is still a problem in the Great Lakes because it is carried by wind from other countries. While 92% of respondents indicated they understood the term toxic, and 89% understood pesticide, only 50% understood the term dioxin.

Although 49% of respondents knew that many levels of government are involved in managing the Lakes, only 19% correctly identified The International Joint Commission as the organization established to oversee U.S. and Canadian use of the Lakes. About half could identify the "ecosystem approach" to management of the lakes that the IJC has adopted. About half the respondents indicated they understood the term ecosystem (55%), ecosystem approach (46%), or remedial action plan (48%).

Respondents underestimated the economic value of the lakes with only 20% knowing that water-based tourism is worth $8 to $12 billion per year and 13% that the fishery is worth about $1 billion per year. Respondents also underestimated the amounts and uses of water in the Lakes, with 38% knowing that the Great Lakes hold 95% of the surface water in North America, 29% knowing that the greatest consumptive use of water is by municipalities, and 34% knowing that most proposed water diversions would cause water levels to decrease a little. Some 60% of respondents knew that nuclear power plants are built on the lakes because they use water to cool their reactors.

About 26% of respondents recognized residential use as the most common use of shoreline along the Great Lakes. About half the respondents knew that the most significant cause of shoreline erosion is wave action (56%) and that the most serious problem associated with dredging is stirring up toxic wastes (56%). Approximately 60% of respondents knew that seasonal changes in lake levels are caused by precipitation rather than diversions, regulation or water use. Some 87% of respondents understood the term erosion, 71% lake level regulation, and 61% diversion.

Great Lakes Opinion

Mean environmental opinion for the library respondents was 3.9 on a Likert scale of 1 to 5, with 5 representing the most favorable environmental opinion as determined by the review panel. The mean for the mall respondents was 3.7. Library respondents scored significantly higher on the opinion scale than did mall respondents, although both sample populations held positive environmental opinions and responded similarly to the statements. This suggests that while both groups felt similarly about the problems and issues, the library respondents may have felt more strongly than did the mall respondents.

Opinion items from the survey were not included in the broadcast, thus library respondents had not been exposed to this part of the questionnaire before taking the survey. This would seem to indicate that respondents who watched the broadcast and went to the library to take the survey may have started with more positive or with stronger environmental opinions than the mall respondents even before watching the broadcast. In fact, these respondents may have chosen to participate in the survey because they were interested in and concerned about the Great Lakes environment.

However, it is also possible that the broadcast itself contributed to the higher opinion scores of library respondents even though they were not directly exposed to the opinion statements. It is unlikely that simply reading an opinion statement and giving information about how others had responded to the statement, the format used with the knowledge questions, would result in a change in people's opinions. The video clips that were broadcast, though, contained people's expressions of how important the Lakes were to them, showed aesthetically pleasing views of the Lake, and provided viewers with much factual information upon which they could base opinions.

For both library and mall respondents, environmental opinion was most highly correlated with score on the knowledge items, number of words known, and education level. The higher environmental opinion scores of library respondents are thus consistent with their higher knowledge scores and higher word scores. However, the mall and library samples did not differ significantly in education level indicating that education level did not explain the difference in opinion scores between the two groups. Although mall respondents had significantly higher annual incomes and library respondents were

significantly older and had lived in Cleveland significantly longer, correlations of environmental opinion with these and other demographic characteristics were low to negligible.

Concerning issues facing the Lakes, respondents felt that some parts of the Lake Erie shoreline should be off limits to development, more shoreline should be set aside as parks, natural gas should not be tapped if it would cause environmental harm, toxic chemicals should be cleaned up regardless of the cost, wetlands should not be filled in for homesites, factories that would create jobs but harm the environment should not be built, water from the Great Lakes should not be diverted to other parts of the country, air pollution is a serious problem in the Great Lakes, and measures should be taken to prevent extinction of endangered species.

Concerning personal environmental behavior, respondents indicated that they would be willing to give up some foods or household items to reduce pollution, that pollution by individuals does affect the Lakes, that people should not be allowed to take as many fish as they want from the Lake, and that people should not have the right to do whatever they want with shoreline property.

Concerning management of the Lakes, respondents felt that citizens should be involved in the management of the Lakes, that government should be doing more to control pollution in Lake Erie, and that Lake Erie's problems can not be solved by enforcing current anti-pollution laws. Respondents were undecided about whether Ohio is doing its part to protect the Lakes.

Respondents were also undecided as to whether agriculture pollutes as much as industry and whether environmental problems are worse in the Great Lakes than in the rest of the country. Respondents did not feel that most of Lake Erie's environmental problems have been exaggerated, nor that the most serious of Lake Erie's problems have been solved, nor that technology will solve all environmental problems soon. Respondents believed that environmental, social, political, and economic problems are related and that the value of Lake Erie can not be measured simply in dollar value. Library respondents disagreed with the statement "Lake Erie is very polluted and ugly" while mall respondents were generally undecided on this statement.

Sex, Information Source, and Membership

For both library and mall respondents, males scored significantly higher than females on the knowledge items and knew significantly more words than did females. Males and females did not differ significantly in environmental opinion. While males were more environmentally knowledgeable than females, males and females were equally concerned about the environment and held similar environmental opinions. Males and females did not differ in information source used or in membership in fishing, boating, civic, or environmental groups, thus these factors did not explain the difference in knowledge or word scores between males and females.

Television was the primary source of Great Lakes information for most respondents, followed by newspapers. Of the mall respondents, 55% indicated their primary source of Great Lakes information is television, 25% indicated newspapers, 5% cited magazines, 4% cited lake and lakeshore activities, 3% cited museums and nature centers, and 7% cited other sources, mostly friends or relatives. Of the Library respondents, 44% cited television, 28% newspapers, 6% magazines, 8% lake and lakeshore activities, 7% museums and nature centers, and 7% other sources. Respondents who cited "other" sources and wrote in a response primarily cited relatives or friends who worked in some field related to the lakes. A few respondents cited books or school studies.

Mall respondents who cited newspapers as their primary source of information about the Great Lakes scored significantly higher on the knowledge items and knew significantly more words than those who cited television. There were no differences in mean opinion scores among the six information source groups. Library respondents who cited lake activities had significantly higher knowledge scores than those who cited television. Those who cited lake activities or newspapers knew significantly more words than those who cited television. There were no significant differences in environmental opinion among those citing each of the information sources. These results suggest that respondents who use newspapers as their media source, or who have personal experience with lake and lakeshore activities, are more knowledgeable about the Great Lakes than those who use television, however, environmental opinions do not differ by media use.

Mall respondents who cited newspapers were significantly older and had significantly higher education levels than those who cited television or other. Library

respondents who cited newspapers were significantly older than those who cited museums or other and had significantly higher education levels than those who cited television. These results are consistent with studies finding newspaper readers to be older and to have higher education levels than people who use other media sources. There were no differences for mall respondents among the six information groups in mean annual income or number of years lived in Cleveland. There were no differences for library respondents in mean annual income, number of days viewing the broadcast, or years lived in Cleveland, although those who cited newspapers or lake activities had lived in Cleveland longer than those who cited other. Because age of respondent was substantially correlated to number of years lived in Cleveland, the fact that those citing newspapers had lived in Cleveland longer is likely a result of their also being older. These results suggest that media use did not differ according to respondents' income or how long they had lived in Cleveland and that viewing the broadcast did not influence respondents to indicate television as their primary information source.

Of the mall respondents, 5% belonged to a boating club, 9% to a civic or community group, 7% to an environmental interest group, and 4% to a fishing club. Of the library respondents, 5% belonged to a boating club, 10% to a civic or community group, 6% to an environmental interest group, and 5% to a fishing club.

For mall respondents, boating club members had significantly higher knowledge and word scores, civic group members had significantly higher word scores and incomes and environmental group members had significantly higher education levels and opinion and word scores than nonmembers of each group. For library respondents, boating club members had significantly higher education levels, civic group members had significantly higher education levels, knowledge scores, and word scores, environmental group members had significantly higher knowledge, word, and opinion scores, and fishing club members had significantly higher opinion scores than nonmembers of each group. It seems likely people join a fishing, boating, or environmental group because they have outdoor and environmental interests, concern, and knowledge to begin with and that membership in such a group reinforces, strengthens, or improves such interest, concern, and knowledge.

In general, there were no differences in the demographic characteristics of age, years lived in Cleveland, income, or number of times respondents viewed the broadcast between members and nonmembers of civic, environmental, boating, and fishing groups for either the mall or the library respondents and only low correlations with respondents' sex. Although members of such groups tend to have higher education levels, they do not appear to differ from nonmembers in other demographic characteristics.

Mall respondents who cited lake activities as their primary source of Great Lakes information belonged to more organizations than those who cited television. Library respondents who cited lake activities, magazines, or museums belonged to more organizations than those who cited television or newspapers. It seems likely that people who belong to an organization may receive a magazine from that organization, or that people who visit museums may belong to a museum as a member, or that people who cite lake activities may belong to a fishing or boating club. Thus, media source may be related to membership in an organization. Further analysis showed that library respondents who belonged to fishing and boating clubs tended to cite lake activities more often than those who did not belong to such a club, otherwise membership in a boating, fishing, environmental, or civic group had only low or negligible correlations with information source cited for both mall and library respondents. Thus, it seems that respondents who belong to fishing or boating clubs use their personal experiences with lake activities as their source of Great Lakes information, while media source for respondents in civic and environmental groups does not differ from that of a more general public.

Impact of the Television News Show

Mean scores for subscales of broadcast and nonbroadcast items were compared for the library respondents who had watched the broadcast all of the days on which the broadcast items had been televised. In this way, these library respondents served as their own control group because they had been exposed to the treatment (the WJW-TV8 broadcast) as measured by the broadcast items and not exposed to the broadcast treatment as measured by the nonbroadcast items. On all three forms, and on the three forms combined, respondents' mean scores on the broadcast items were significantly higher for the broadcast items than for the nonbroadcast items. However, it was possible that the

broadcast items on the questionnaire were easier than the nonbroadcast ones, thus explaining the higher scores on the broadcast items.

For this reason, the mean knowledge scores on broadcast and nonbroadcast items were compared for the mall respondents to assess the difficulty of the items. On forms A and C, and when the three forms were combined, the mean score on the nonbroadcast items was significantly higher than the mean score on the broadcast items, suggesting that the broadcast questions were actually more difficult than the nonbroadcast ones. On form B, the mean score on the broadcast items was significantly higher than the mean score on the nonbroadcast items, suggesting that on this form, the broadcast items may have been easier. However, the mean score for the nonbroadcast items on form B was the same for both the library and mall samples, therefore, the mean score for the broadcast items should also have been the same for the two groups. In fact, the mean score on the broadcast items was higher for the library than for the mall respondents.

When scores on all three forms were combined, the means on the broadcast items for library respondents were significantly higher than on nonbroadcast items, while for mall respondents there was no significant difference in the means between the broadcast and nonbroadcast items. Therefore, the higher scores on the broadcast items than on the nonbroadcast items for the library respondents were most likely due to the televised broadcast and not to the differences in difficulty between broadcast and nonbroadcast items (Table 28).

It is important to note here that the impact of the televised broadcast was not determined by comparing the mean knowledge scores of library and mall respondents. Library respondents scored significantly higher than mall respondents on the total knowledge score, the broadcast items, and the nonbroadcast items. These differences were likely due both to demographic differences between the two sample populations and to the fact that only the library respondents received the treatment. Impact of the televised broadcast was determined by comparing scores among the same population, the library respondents who had watched all of the relevant days of the broadcast. Because these respondents acted as their own comparison group, differences in mean scores were due to the treatment, not to demographic differences. Higher scores on the broadcast items than

on the nonbroadcast items indicate that the televised broadcast was effective in increasing public knowledge about the Great Lakes.

Generalizability

Library respondents who did and did not watch the broadcast did not differ significantly in their knowledge scores or the mean number of words they knew. Those who watched the broadcast had significantly higher mean opinion scores, were significantly older and had lived in Cleveland significantly longer, but respondents did not differ in education level, income, or number of organizations to which they belonged. Correlations between whether respondents watched the broadcast and their sex, information source, and membership in a boating, civic, environmental, or fishing organization were low to negligible.

Library respondents as a group scored significantly higher than mall respondents on the knowledge, words, and opinion scales. Library respondents were significantly older and had lived in Cleveland significantly longer than mall respondents while mall respondents had significantly higher incomes than library respondents. However, the two groups did not differ significantly in education level, or number of organizations to which they belonged, and relationships with information source, sex, and membership in fishing, boating, civic, or environmental groups were low.

While library respondents who watched the broadcast had more positive environmental opinions than those who did not watch the broadcast, and while the library respondents were more knowledgeable and had more positive environmental opinions than the mall respondents, it seems reasonable to suggest that the knowledge scores of both the library respondents who did not watch the broadcast and of the mall respondents could also have been increased had they seen the televised broadcast.

Information on age, education, income, years lived in Cleveland, and proportion of males and females for the library and mall sample populations, for the WJW-TV8 viewership, and for Cuyahoga County is provided in Tables 29 through 33. Similarities among the four groups may allow generalization of the findings of this study to the people of Cuyahoga County, Ohio, however, they can not be generalized beyond that.

TABLE 28
Comparison of Knowledge Scores on Broadcast and Nonbroadcast Items — Library and Mall Samples, T-Tests

	Library t-test			Mall t-test		
	N	Mean	Prob.	N	Mean	Prob.
Form A						
Broadcast	63	2.7	.00	185	1.4	.02
Nonbroadcast		2.0			1.6	
Form B						
Broadcast	38	2.8	.00	191	2.1	.00
Nonbroadcast		1.5			1.5	
Form C						
Broadcast	34	3.0	.00	193	1.8	.00
Nonbroadcast		2.5			2.1	
Combined Forms						
Broadcast	135	2.8	.00	570	1.8	.16
Nonbroadcast		2.0			1.7	

TABLE 29
Comparison of Ages Among TV8 Viewers, Mall and Library Samples, and County Population

Years	TV	Census	Mall	Library
18-24	9.9	8.9	21.7	4.7
25-34	28.4	15.5	25.6	3.3
35-44	22.3	10.5	25.6	11.5
45-54	12.9	11.1	9.7	15.5
55-64	11.7	11.8	4.7	19.8
65+	14.7	12.8	6.1	26.8
Mean			33.4	50.2

TABLE 30
Comparison of Years Lived in Cleveland Among TV8 Viewers, Mall and Library Samples, and County Population

Years	TV	Census	Mall	Library
<2	9.1		6.3	1.0
3-5	15.7		6.6	2.9
6-10	17.9		5.8	2.2
11-15	12.4		10.2	6.7
16-20	9.1		17.5	6.0
21-25	9.6		12.2	5.0
26-40	26.2		26.5	25.1
41+			14.8	51.2

TABLE 31
Comparison of Education Level Among TV8 Viewers, Mall and Library Samples, and County Population

Years	TV	Census	Mall	Library
<8	1.3	14.5	6.6	4.6
1-3 High School	7.12		11.6	6.6
4 High School	50.5	55.5	28.7	41.8
1-3 College	18.5	14.2	25.9	18.3
4+ College	22.7	15.7	27.3	31.1
Mean			13.5	13.5

TABLE 32
Comparison of Annual Income Among TV8 Viewers,
Mall and Library Samples, and County Population

Thousand $	TV	Census	Mall	Library
<10	8.7	27.9	4.4	5.0
10-14	9.3	13.7	6.7	9.4
15-19	11.4	13.4	9.3	14.1
20-24	11.7	12.5	13.7	13.8
25-34	19.2	17.0	20.2	24.8
35-49	26.5	10.2	16.6	16.3
50+	13.1	5.2	29.0	16.6
Mean		21387	38116	31843

TABLE 33
Comparison of Proportion by Sex Among TV8 Viewers,
Mall and Library Samples, and County Population

Sex	TV	Census	Mall	Library
Males	50.3	47.3	55.7	48.1
Females	49.7	52.7	44.3	51.9

Recommendations for Further Research

This study investigated the impact of a television news show on public environmental knowledge levels, however, it did not measure the impact of such a broadcast on environmental opinions. The sample populations used in this study limit the generalizability of the findings. Ideally, in future studies, a more random sample of respondents, perhaps by mail or telephone survey, should be used. These respondents could indicate what television news show or programs they usually watch. The same group of respondents could be tested after the broadcast and changes in both knowledge and opinions compared for those who did and did not watch the broadcast. Such a study would use a Pre-test Post-test Control Group or Solomon Four Group design.

The format and number of questions that could be used on the survey were somewhat constrained by the format of the questionnaire and by the television station requirements. Because the questions used on the library survey were identical to those on the broadcast, they really only measure respondents' recall of the question and answer. Information gain and retention was only tested for a two week period. Future studies should investigate higher order learning resulting from television broadcasts and retention of such learning.

This study asked respondents to identify their primary source of Great Lakes information, but only measured the impact of one of these sources in educating about the Great Lakes. It is possible that those who cite newspapers or other information sources would learn from these sources or that these other sources might be more effective in bringing about knowledge gain or opinion change than a television broadcast. Future studies should compare the effectiveness of different media sources providing the same information in obtaining knowledge gain or opinion change.

This study used only Pearson correlations and cross tabulations to measure relationships between environmental knowledge and opinion and demographic characteristics. Thus, nothing can be said about the relative contributions of each characteristic in explaining differences in knowledge and opinions. Future studies should use multiple regression analysis in order to assess the relative importance of each characteristic.

Finally, this study focused on one population, people in the City of Cleveland, Ohio, thus the results may not hold true for other populations. It is possible that people in

other areas of the Great Lakes Basin may have different knowledge levels and different environmental opinions. Future studies should investigate the knowledge and opinions of others in the Great Lakes Basin. Because the Great Lakes are a shared, international resource, studies should also investigate whether Canadians differ from Americans in knowledge of and opinions towards the Great Lakes.

Implications for Great Lakes Management and Education

This study generated a list of environmental issues facing the Great Lakes and provided information concerning what the public does and does not know and the opinions that they hold about these Great Lakes issues. In addition, it provided information concerning public media use in obtaining Great Lakes information. Such information about public knowledge, opinion, and media use should prove valuable to those concerned with Great Lakes management and education.

This study has indicated that public knowledge levels in Cleveland, Ohio, about the Great Lakes are generally low while opinions about issues facing the Lakes are generally positive, that is environmentally favorable. Earlier studies of Great Lakes knowledge and awareness of Ohio fifth and ninth graders also found low knowledge levels among students, but these levels did increase during the school years. This study has extended the earlier student studies to an adult audience that is no longer learning in a school setting. The results of this study show that television, followed by newspapers, is the primary source of Great Lakes information for the majority of this group. It is through these sources that the adult public is learning about and forming opinions on the resources of and environmental issues facing the Great Lakes.

Newspaper readers in this study tended to be older and to have higher education levels than those who used other media sources and to be more knowledgeable about the Great Lakes. Whether people are more informed because they read newspapers or whether more informed people choose newspapers as their media source can not be answered by this study, but it seems likely that some combination of the two is occurring. Focusing exclusively on newspapers as the medium for educating the public about the Great Lakes may then lead to an "information gap" with already more knowledgeable people becoming more informed while less knowledgeable people remain relatively uninformed.

Television documentaries on the environment, often shown on public television stations, may have a similar effect if they are watched by those people who are already interested in, knowledgeable of, and concerned about the environment.

This study attempted to reach a more general adult public by using a local network television news show to convey information about the Great Lakes. Results of this study showed that the news show broadcast was indeed effective in increasing knowledge levels among those who viewed the broadcast. To the extent that the television news show viewership is representative of the general public, it seems that this media format can be an effective way to educate the public about the Great Lakes and about environmental issues.

Environmental coverage and reporting on television has increased over the past few years with magazine programs such as 20/20, Sixty Minutes, and Nightline covering environmental issues in detail. Several new series focusing on the environment are also in production, for example Boston's WGBH State of the World to air in 1990, Pittsburgh's WQED Man and Nature and Conserving America series, and Nature's Page and the Cousteau Society's Rediscovery of the World on WTBS (Daviss, 1988). According to the National Wildlife Federation (1989), although the environment ranked 13th out of 18 categories in network news coverage in 1988, air time about the environment increased from 68 minutes in the first quarter of the year to 150 minutes in the fourth quarter. WQED's executive vice-president Thomas Skinner, in discussing the role of television in reporting environmental issues, stated "we've saturated the market with programs that tell us how wonderful the natural world is. There isn't a night that goes by without PBS viewers seeing something that swims, flies, crawls, or runs over the landscapes. People's awareness has been heightened. There aren't a lot of animals and habitats left to report on. Environmental coverage is the next step, the next generation of this kind of material" (Daviss, 1988, p. 6).

In this study, members of boating, fishing, civic, and environmental organizations tended to have higher knowledge levels, more positive environmental opinions, and higher education levels than those who were not members of such a group. It seems likely people join such a group because they have outdoor, environmental, or civic interests and that membership in such a group reinforces these interests. Media use for members of civic and environmental groups did not differ from that of nonmembers, but those in

fishing and boating clubs tended to cite lake activities as their primary information source.

Thus, "mainstream" media sources such as television and newspapers may be effective in reaching members of civic and environmental groups while more specialized media related to lake activities may be more effective in reaching those in fishing and boating clubs. Such media might include articles in fishing and boating newspapers or magazines, displays at marinas and boat shows, or video segments on fishing television shows. The use of newspapers in educating about the Great Lakes should not be overlooked, however, as a substantial number of people, some 25%, cited newspapers as their primary source of information about the Great Lakes. These people also tend to be more knowledgeable and may be opinion leaders in their communities.

It is important to continue to target audiences consisting of boating, fishing, civic, and environmental organization members even though they are already more informed and concerned than the general public, precisely because they are already more informed and concerned. These people, if politically active as well, are likely to be influential in decisions concerning Great Lakes issues. This is especially true as most respondents in this study felt that citizens should be involved in management decisions. For those concerned with management of the Great Lakes, these groups can represent an important constituency supportive of or in opposition to agency decisions.

While this study focused on public knowledge of and opinions towards the Great Lakes, many of the resource and environmental issues addressed extend beyond the Great Lakes Basin. Loss of wetlands, endangered species, toxic wastes, eutrophication, agricultural runoff, air pollution, pesticides, exotic species, water use, energy production, shoreline erosion, and land development are problems and issues facing much of the country. Those concerned with Great Lakes education are not just educating about the Great Lakes themselves but about the gamut of environmental concerns as they are evidenced in the context of the Great Lakes.

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Appendix A
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GREAT LAKES ISSUE LIST

SOURCES AND/OR EFFECTS OF THE FOLLOWING ON THE GREAT LAKES:

Dredging of harbors
Draining and filling of wetlands
Land use in the basin
Invading plants and animals, including fish
Air pollution and acid rain
Diversion of water out of the basin
Changing global climate
Groundwater contaminants
Concentration of contaminants through food chain
Water use by cities, towns, and industry
Agricultural practices
Beach litter
Toxic chemicals
Nutrients (phosphates, nitrates)

ECONOMIC IMPORTANCE TO AND VALUE OF THE GREAT LAKES:

Minerals and mining
Lake effect on weather
Regional agriculture
Erosion and sedimentation
Fisheries resources (sport and commercial)
Shipping from Great Lakes ports
Changes in lake water levels
Preserving endangered species (biodiversity)
Water quality and quantity
Shoreline development and uses
Wetlands
Tourism and recreation
Power production

RESPONSE TO GREAT LAKES ISSUES

U.S./Canadian environmental laws
Ecosystem approach to management
Personal, governmental, and industrial responsibility
Waste management practices, disposal
Land use planning

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Appendix B
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February 27, 1989

Dear

The Ohio State University, with the support of the George Gund Goundation, is conducting a study to determine the present level of public information concerning the Great Lakes and whether television can be used to enhance this information level. In May, Channel 8 in Cleveland will broadcast questions about the resources of and issues facing the Great Lakes. Prior to the broadcast, survey questionnaires will be distributed at shopping malls at several locations in the city. These questionnaires will serve as a pretest, and their results will be broadcast by the television station so that viewers can compare their answers to the shopping area sample.

Questions for the shopping center survey and t.v. test are now being developed. We would appreciate your comments and suggestions about these questions based on your expertise of the Great Lakes. These questions are also being reviewed by science educators for appropriate question construction and wording. A composite list of Great Lakes environmental issues was developed using documents from a number of Great Lakes agencies and was revised following review by a panel from these agencies. A copy of this issue list and of the survey questions is enclosed for your review. Specifically, we would like to know the following:

1. Do you think the questions adequately reflect the issues as stated on the issue list?

2. Are there any issues on the issue list not adequately covered by at least one question?

3. Is the answer provided for each question correct?

4. Is the answer provided for each question the only correct answer?

5. Do you have any other comments or suggestions concerning any of the questions?

Because of survey printing and television station deadlines, we hope you can respond by March 7. Finally, we would like to invite you to serve as an advisor to this project. We do not expect that the task will require much of your time, but we do value your input on project activitiessuch as the survey items. An abstract of the project is enclosed for your information.

Thank you for your assistance in reviewing these questions and for your ongoing efforts to promote awareness of the Great Lakes.

Sincerely,

Rosanne W. Fortner
Associate Professor

Chris Brothers
Graduate Research Associate

May 10, 1989

Dr. Jack Vallentyne
Canada Center for Inland Waters
867 Lakeshore Road
Burlington, Ontario L7S 1A1

Dear Jack,

Our study of the level of public knowledge about the Great Lakes is coming along well! The survey was administered in two shopping centers in Cleveland in April. The data from this survey are now being analyzed, and the television broadcasts of the survey items are scheduled for the week of May 21. Thanks again for reviewing the surveys and helping us get to this point.

Before the second survey is made available in the Cleveland Libraries, we would like some input from members of the review panel concerning the attitude section of the survey. Specifically, we would like you to rate what you feel is the appropriate environmental response to each of the attitude items. We have enclosed copies of the three survey forms for you to use. Simply circle the choice you feel best represents an environmentally informed or concerned response to items 13-21. If you have any comments concerning the items, please write them in as well.

We appreciate your assistance in serving on the review panel for this study and will keep you informed of its progress and results. Thanks!

Sincerely,

Rosanne Fortner
Associate Professor

Chris Brothers
Graduate Research
Associate

Survey Review Panel

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Chairperson of the Technical Advisory Committee
of the International Association for Great Lakes Research

Appendix C
Great Lakes Survey Questionnaires and
Survey Forms with Answers and References

Great Lakes Survey

Survey A

DIRECTIONS: Circle the number of the best answer for each of the following.

1. The Great Lake that produces more fish for human food than all the other Great Lakes combined is
   1. Ontario.
   2. Erie.
   3. Huron.
   4. Michigan.

2. The cheapest way of transporting iron ore from Duluth, MN, to Buffalo, NY, is by
   1. truck.
   2. train.
   3. airplane.
   4. boat.

3. Most of the toxic chemicals in Lake Superior and half of those in Lake Michigan get there from
   1. sewage treatment plants.
   2. farm runoff.
   3. air pollution.
   4. industrial wastes.

4. In the last 15 years, the amount of phosphorus in the Great Lakes has
   1. increased a little.
   2. remained about the same.
   3. been reduced a little.
   4. been reduced a lot.

5. Managing the Great Lakes is difficult because there
   1. are no international treaties.
   2. is little scientific research.
   3. are many levels of government involved.
   4. are few water pollution laws.

6. Which is the greatest consumptive use of Great Lakes water?
   1. Municipal
   2. Manufacturing
   3. Power production
   4. Agricultural

7. The most likely way people are exposed to hazardous chemicals in the Great Lakes is from
   1. drinking water.
   2. swimming.
   3. eating fish.
   4. eating produce.

8. Marshes along the Great Lakes have been disappearing rapidly because
   1. people have drained and fill them.
   2. much less rain has been entering them.
   3. high lake levels have flooded the marshes.
   4. marsh water has drained out to the lakes.

9. A major "industry" of several of the Great Lakes states and Ontario that results from the influence of the lakes on climate is
   1. producing electricity.
   2. raising fruit crops.
   3. sport fishing.
   4. shipping.

10. The Great Lakes fishery has an estimated economic value of about
    1. $100 thousand per year.
    2. $1 million per year.
    3. $100 million per year.
    4. $1 billion per year.

11. The most likely cause of seasonal changes in lake levels is
    1. diversions of water.
    2. regulation of the lake.
    3. agricultural water use.
    4. precipitation.

12. The "ecosystem approach" to Great Lakes management
    1. emphasizes the biological aspects of the ecosystem.
    2. emphasizes the physical and chemical aspects of the ecosystem.
    3. focuses on the human impacts on the ecosystem.
    4. integrates human, physical, biological, and chemical aspects of the ecosystem.

Do not write in this space

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10 _____
11 _____
12 _____

over for more questions, please

There are no correct answers to the remaining items.
For each of the following statements, please <u>circle the appropriate choice.</u>

	strongly agree	agree	undecided no opinion	disagree	strongly disagree	Do not write in this space
13. A new factory that will create jobs should be built even if it will harm the environment.	1	2	3	4	5	13____
14. We shouldn't worry about environmental problems in the Great Lakes because technology will solve them all soon.	1	2	3	4	5	14____
15. Government should be doing more to control pollution in Lake Erie.	1	2	3	4	5	15____
16. If other parts of the United States need water, we should send them Great Lakes water.	1	2	3	4	5	16____
17. People who own shoreline property should have the right to do what they want with it.	1	2	3	4	5	17____
18. More sections of Lake Erie shoreline should be set aside as parks for people's enjoyment.	1	2	3	4	5	18____
19. Measures should be taken to prevent the extinction of endangered species in Lake Erie.	1	2	3	4	5	19____
20. People should be allowed to take as many fish as they want from Lake Erie.	1	2	3	4	5	20____
21. Lake Erie is very polluted and ugly.	1	2	3	4	5	21____

When people talk about the following Great Lakes topics, do you know what they mean?

<u>Circle for each term</u>	yes or no		Do not write in this space
22. <u>eutrophication</u>	yes	no	22____
23. <u>fish advisory</u>	yes	no	23____
24. <u>ecosystem approach</u>	yes	no	24____
25. <u>pesticide</u>	yes	no	25____
26. <u>estuary</u>	yes	no	26____
27. <u>nutrient</u>	yes	no	27____
28. <u>toxic</u>	yes	no	28____
29. <u>phosphate (phosphorus)</u>	yes	no	29____
30. <u>lake level regulation</u>	yes	no	30____
31. <u>ecosystem</u>	yes	no	31____
32. <u>diversion</u>	yes	no	32____
33. <u>remedial action plans</u>	yes	no	33____
34. <u>erosion</u>	yes	no	34____
35. <u>dioxin</u>	yes	no	35____

36. Where do you get most of your information about the Great Lakes?
<u>Circle one.</u>
1. television
2. newspapers
3. magazines
4. lake and lakeshore activities
5. museums and nature centers
6. other (write in) _____

Are you a member of any of the following?
<u>Circle all those that apply.</u>
37. boating club
38. civic or community group
39. environmental interest group
40. sport fishing club
41. none of the above

42. Sex **<u>Circle one.</u>** Female Male

43-44. Age (Number of years). _____

Do not write in this space: 36____ 37____ 38____ 39____ 40____ 41____ 42____ 43

45-46. How many years have you lived in the Cleveland area? **<u>Write 0 if you do not live in the Cleveland area.</u>** _____

47-48. How many years of school have you completed? _____

49-54. What is your approximate family income in a year? _____

55-56. How many people are supported on this income? _____

64. Please **<u>circle the days and times</u>** you watched the Great Lakes Survey on Channel 8. If you did not watch the Survey **<u>write 0</u>**. _____

Mon.	Tues.	Wed.	Thurs.	Fri
12	12	12	12	12
6	6	6	6	6
11	11	11	11	11

Do not write in this space: 45 47 49 55 Form A p Site Coder 64

THANK YOU FOR YOUR HELP WITH OUR SURVEY !

Great Lakes Survey

Survey B

DIRECTIONS: **Circle the number of the best answer** for each of the following.

1. The Great Lake that produces more fish for human food than all the other Great Lakes combined is
   1. Ontario.
   2. Erie.
   3. Huron.
   4. Michigan.

2. Deposits of which resources have been found under Lake Erie?
   1. natural gas and salt
   2. coal and cobalt
   3. oil and magnesium
   4. iron ore and copper

3. The organization established in 1909 by the Boundary Waters Treaty to oversee U.S. and Canadian use of the Great Lakes was
   1. The Great Lakes Commission.
   2. The International Joint Commission.
   3. The Council on the Great Lakes.
   4. Great Lakes United.

4. When a lot of nutrients flow into the Great Lakes there is an increase in
   1. fish catches.
   2. water temperatures.
   3. algae blooms.
   4. chemicals in the soils.

5. The best way to prepare Great Lakes fish to reduce contaminants in them is to
   1. pan fry them in their own fat.
   2. cut away fat, then broil on a rack.
   3. freeze before cleaning and cooking.
   4. rinse in salt water before cleaning.

6. Some Lake Erie fish have become endangered because
   1. there are too many predator fish eating them.
   2. there is too little food for them to eat.
   3. their spawning grounds have been destroyed.
   4. fishing laws do not protect them.

7. DDT was banned in the U.S. in 1971, but it is still a problem in the Great Lakes because it
   1. is dissolved in the lake water.
   2. does not break down at all.
   3. is carried by wind from other countries.
   4. is still heavily used in the U.S.

8. The main products shipped on the Great Lakes today are
   1. manufactured goods such as cars.
   2. fresh and processed foods.
   3. lumber and stone for building.
   4. iron ore, grain, and coal.

9. The most common use of the shoreline along the Great Lakes is
   1. commercial.
   2. residential.
   3. agricultural.
   4. recreational.

10. Most proposed diversions of water from the Great Lakes would cause water levels to
    1. increase a lot.
    2. decrease a lot.
    3. increase a little.
    4. decrease a little.

11. The major source of phosphorus in the Great Lakes is
    1. agricultural runoff.
    2. industrial waste.
    3. laundry detergents.
    4. mining waste.

12. The "ecosystem approach" to Great Lakes management
    1. emphasizes the biological aspects of the ecosystem.
    2. emphasizes the physical and chemical aspects of the ecosystem.
    3. focuses on the human impacts on the ecosystem.
    4. integrates human, physical, biological, and chemical aspects of the ecosystem.

Do not write in this space

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12 _____

over for more questions, please

There are no correct answers to the remaining items.
For each of the following statements, please <u>circle the appropriate choice.</u>

	strongly agree	agree	undecided no opinion	disagree	strongly disagree	Do not write in this space
13. The value of Lake Erie to Ohio residents can be measured simply by its dollar value.	1	2	3	4	5	13____
14. I would be willing to give up some kinds of foods or household items, even if it were inconvenient and would cost more, if it would produce less pollution.	1	2	3	4	5	14____
15. Lake Erie wetlands and marshes should be filled in to make more land for homes.	1	2	3	4	5	15____
16. The Great Lakes are so vast that pollution by individuals has practically no effect on them.	1	2	3	4	5	16____
17. Ohio is doing its part to protect the Great Lakes.	1	2	3	4	5	17____
18. Toxic chemicals going into the Great Lakes should be cleaned up, regardless of the cost.	1	2	3	4	5	18____
19. Most of Lake Erie's environmental problems have been exaggerated.	1	2	3	4	5	19____
20. We could solve Lake Erie's problems by enforcing the anti-pollution laws we have.	1	2	3	4	5	20____
21. Lake Erie is very polluted and ugly.	1	2	3	4	5	21____

When people talk about the following Great Lakes topics, do you know what they mean?

<u>Circle for each term</u>	yes or no	Do not write in this space
22. eutrophication	yes no	22____
23. fish advisory	yes no	23____
24. ecosystem approach	yes no	24____
25. pesticide	yes no	25____
26. estuary	yes no	26____
27. nutrient	yes no	27____
28. toxic	yes no	28____
29. phosphate (phosphorus)	yes no	29____
30. lake level regulation	yes no	30____
31. ecosystem	yes no	31____
32. diversion	yes no	32____
33. remedial action plans	yes no	33____
34. erosion	yes no	34____
35. dioxin	yes no	35____

36. Where do you get most of your information about the Great Lakes?
<u>Circle one.</u>
1. television
2. newspapers
3. magazines
4. lake and lakeshore activities
5. museums and nature centers
6. other (write in) _____

Are you a member of any of the following?
<u>Circle all those that apply.</u>
37. boating club
38. civic or community group
39. environmental interest group
40. sport fishing club
41. none of the above

42. Sex <u>Circle one.</u> Female Male

43-44. Age (Number of years) _____

Do not write in this space
36____
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39____
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41____
42____
43

45-46. How many years have you lived in the Cleveland area? <u>Write 0 if you do not live in the Cleveland area.</u> _____

47-48. How many years of school have you completed? _____

49-54. What is your approximate family income in a year? _____

55-56. How many people are supported on this income? _____

64. Please <u>circle the days and times</u> you watched the Great Lakes Survey on Channel 8. If you did not watch the Survey <u>write 0</u> _____

Mon.	Tues.	Wed.	Thurs.	Fri
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THANK YOU FOR YOUR HELP WITH OUR SURVEY !

133

Great Lakes Survey

Survey C

DIRECTIONS: Circle the number of the best answer for each of the following.

1. The Great Lake that produces more fish for human food than all the other Great Lakes combined is
   1. Ontario.
   2. Erie.
   3. Huron.
   4. Michigan.

2. Sea lampreys have been a problem in the Great Lakes because they
   1. eat young yellow perch and eggs.
   2. use up food needed by other fish.
   3. destroy water plants near the shore.
   4. are parasites on trout and other fish.

3. Eutrophication means
   1. poisoning by chemicals.
   2. competition between animals.
   3. the aging of a body of water.
   4. invasion of new fish species.

4. Several nuclear power plants have been built near the Great Lakes because
   1. their fuel can be brought in by ship.
   2. water is used to cool the reactors.
   3. water provides an extra power source.
   4. their fuel is mined under the lakes.

5. A major reason for trying to protect estuaries is that they
   1. contain high concentrations of metal ores.
   2. serve as testing grounds for pollution control.
   3. serve as breeding grounds for fish and wildlife.
   4. provide excellent deep water harbors.

6. This chemical nutrient is closely watched on the Great Lakes because it causes algae blooms:
   1. sodium
   2. phosphorus
   3. potassium
   4. calcium

7. Water-based recreation and tourism in the Great Lakes basin is worth about
   1. $4 to $6 million per year.
   2. $20 to $25 million per year.
   3. $1 to $3 billion per year.
   4. $8 to $12 billion per year.

8. What percent of North America's fresh surface water do the Great Lakes hold?
   1. 95%
   2. 55%
   3. 35%
   4. 20%

9. The most significant cause of shoreline erosion on the Great Lakes is
   1. wave action.
   2. wind action.
   3. groundwater seepage.
   4. surface runoff.

10. The most serious of the environmental problems listed below that dredging of shipping channels may cause is
    1. lowering water levels in the lakes.
    2. increasing algae growth.
    3. stirring toxic wastes into the water.
    4. increasing water temperatures.

11. Which fish from Lake Erie does the Ohio Department of Natural Resources warn people not to eat?
    1. walleye
    2. yellow perch
    3. carp
    4. white bass

12. The "ecosystem approach" to Great Lakes management
    1. emphasizes the biological aspects of the ecosystem.
    2. emphasizes the physical and chemical aspects of the ecosystem.
    3. focuses on the human impacts on the ecosystem.
    4. integrates human, physical, biological, and chemical aspects of the ecosystem.

Do not write in this space

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10 _____
11 _____
12 _____

over for more questions, please

There are no correct answers to the remaining items.
For each of the following statements, please circle the appropriate choice.

	strongly agree	agree	undecided no opinion	disagree	strongly disagree	Do not write in this space
13. Some unusual or delicate areas of Lake Erie shoreline should be off limits to development.	1	2	3	4	5	13____
14. Management of the Great Lakes should be left up to professionals and scientists without citizen involvement.	1	2	3	4	5	14____
15. Natural gas under Lake Erie should not be tapped if it would cause environmental harm.	1	2	3	4	5	15____
16. Agriculture pollutes Lake Erie as much as industry does.	1	2	3	4	5	16____
17. The most serious of Lake Erie's problems have been solved.	1	2	3	4	5	17____
18. Air pollution is a serious problem in the Great Lakes.	1	2	3	4	5	18____
19. Environmental problems are worse in the Great Lakes than in the rest of the country.	1	2	3	4	5	19____
20. Environmental problems are not related to social, political, or economic problems.	1	2	3	4	5	20____
21. Lake Erie is very polluted and ugly.	1	2	3	4	5	21____

When people talk about the following Great Lakes topics, do you know what they mean?

Circle for each term	yes	or no	Do not write in this space
22. eutrophication	yes	no	22____
23. fish advisory	yes	no	23____
24. ecosystem approach	yes	no	24____
25. pesticide	yes	no	25____
26. estuary	yes	no	26____
27. nutrient	yes	no	27____
28. toxic	yes	no	28____
29. phosphate (phosphorus)	yes	no	29____
30. lake level regulation	yes	no	30____
31. ecosystem	yes	no	31____
32. diversion	yes	no	32____
33. remedial action plans	yes	no	33____
34. erosion	yes	no	34____
35. dioxin	yes	no	35____

36. Where do you get most of your information about the Great Lakes?
Circle one.
1. television
2. newspapers
3. magazines
4. lake and lakeshore activities
5. museums and nature centers
6. other (write in) _____

Are you a member of any of the following?
Circle all those that apply.
37. boating club
38. civic or community group
39. environmental interest group
40. sport fishing club
41. none of the above

42. Sex **Circle one.** Female Male

43-44. Age (Number of years). _____

Do not write in this space
36____
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38____
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42____
43

45-46. How many years have you lived in the Cleveland area? **Write 0 if you do not live in the Cleveland area.** _____

47-48. How many years of school have you completed? _____

49-54. What is your approximate family income in a year? _____

55-56. How many people are supported on this income? _____

64. **Please circle the days and times** you watched the Great Lakes Survey on Channel 8. If you did not watch the Survey **write 0** _____

Mon.	Tues.	Wed.	Thurs.	Fri.
12	12	12	12	12
6	6	6	6	6
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THANK YOU FOR YOUR HELP WITH OUR SURVEY !

Great Lakes Survey

Survey A

Answers and References

DIRECTIONS: **Circle the number of the best answer** for each of the following.

1. The Great Lake that produces more fish for human food than all the other Great Lakes combined is
   1. Ontario.
   *2. Erie.
   3. Huron.
   4. Michigan.

The Great Lakes: An Environmental Atlas. 1987. p. 29

2. The cheapest way of transporting iron ore from Duluth, MN, to Buffalo, NY, is by
   1. truck.
   2. train.
   3. airplane.
   *4. boat.

Commercial Navigation. Appendix C9. Great Lakes Basin Commission. p. 106.

3. Most of the toxic chemicals in Lake Superior and half of those in Lake Michigan get there from
   1. sewage treatment plants.
   2. farm runoff.
   *3. air pollution.
   4. industrial wastes.

The Great Lake Erie. 1987. p. 9

4. In the last 15 years, the amount of phosphorus in the Great Lakes has
   1. increased a little.
   2. remained about the same.
   3. been reduced a little.
   *4. been reduced a lot.

The Great Lakes: An Environmental Atlas. 1987. p.30

5. Managing the Great Lakes is difficult because there
   1. are no international treaties.
   2. is little scientific research.
   *3. are many levels of government involved.
   4. are few water pollution laws.

The Great Lake Erie. 1987. p.147. C. 14.

6. Which is the greatest consumptive use of Great Lakes water?
   1. Municipal
   *2. Manufacturing
   3. Power production
   4. Agricultural

Great Lakes Diversions and Consumptive Uses. I.J.C. 1985. p.28

7. The most likely way people are exposed to hazardous chemicals in the Great Lakes is from
   1. drinking water.
   2. swimming.
   *3. eating fish.
   4. eating produce.

The Great Lakes: An Environmental Atlas. 1987. p.30

8. Marshes along the Great Lakes have been disappearing rapidly because
   *1. people have drained and filled them.
   2. much less rain has been entering them.
   3. high lake levels have flooded the marshes.
   4. marsh water has drained out to the lakes.

Erie: The Lake That Survived. 1985. p. 252.

9. A major "industry" of several of the Great Lakes states and Ontario that results from the influence of the lakes on climate is
   1. producing electricity.
   *2. raising fruit crops.
   3. sport fishing.
   4. shipping.

The Great Lakes: An Environmental Atlas. 1987. p. 7.

10. The Great Lakes fishery has an estimated economic value of about
    1. $100 thousand per year.
    2. $1 million per year.
    3. $100 million per year.
    *4. $1 billion per year.

Impact of the Great Lakes on the Region's Economy. 1984. p.8.

11. The most likely cause of seasonal changes in lake levels is
    1. diversions of water.
    2. regulation of the lake.
    3. agricultural water use.
    *4. precipitation.

The Great Lake Erie. 1987. p. 95. C. 11

12. The " ecosystem approach" to Great Lakes management
    1. emphasizes the biological aspects of the ecosystem.
    2. emphasizes the physical and chemical aspects of the ecosystem.
    3. focuses on the human impacts on the ecosystem.
    *4. integrates human, physical, biological, and chemical aspects of the ecosystem.

The Great Lakes: An Environmental Atlas. 1987. p. 40

Do not write in this space

1 _____
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12 _____

There are no correct answers to the remaining items.
For each of the following statements, please circle the appropriate choice.

	strongly agree	agree	undecided no opinion	disagree	strongly disagree	Do not write in this space
13. A new factory that will create jobs should be built even if it will harm the environment.	1	2	3	4	(5)	13
14. We shouldn't worry about environmental problems in the Great Lakes because technology will solve them all soon.	1	2	3	(4)	5	14
15. Government should be doing more to control pollution in Lake Erie.	1	(2)	3	4	5	15
16. If other parts of the United States need water, we should send them Great Lakes water.	1	2	3	4	(5)	16
17. People who own shoreline property should have the right to do what they want with it.	1	2	3	4	(5)	17
18. More sections of Lake Erie shoreline should be set aside as parks for people's enjoyment.	(1)	2	3	4	5	18
19. Measures should be taken to prevent the extinction of endangered species in Lake Erie.	(1)	2	3	4	5	19
20. People should be allowed to take as many fish as they want from Lake Erie.	1	2	3	4	(5)	20
21. Lake Erie is very polluted and ugly.	1	2	3	(4)	5	21

When people talk about the following Great Lakes topics, do you know what they mean?

Circle for each term	yes or no		Do not write in this space
22. eutrophication	yes	no	22
23. fish advisory	yes	no	23
24. ecosystem approach	yes	no	24
25. pesticide	yes	no	25
26. estuary	yes	no	26
27. nutrient	yes	no	27
28. toxic	yes	no	28
29. phosphate (phosphorus)	yes	no	29
30. lake level regulation	yes	no	30
31. ecosystem	yes	no	31
32. diversion	yes	no	32
33. remedial action plans	yes	no	33
34. erosion	yes	no	34
35. dioxin	yes	no	35

36. Where do you get most of your information about the Great Lakes?
Circle one.
1. television
2. newspapers
3. magazines
4. lake and lakeshore activities
5. museums and nature centers
6. other (write in) _____

Are you a member of any of the following?
Circle all those that apply.
37. boating club
38. civic or community group
39. environmental interest group
40. sport fishing club
41. none of the above

42. Sex **Circle one.** Female Male

43-44. Age (Number of years) _____

Do not write in this space	
36	
37	
38	
39	
40	
41	
42	
43	

45-46. How many years have you lived in the Cleveland area? **Write 0 if you do not live in the Cleveland area.** _____

47-48. How many years of school have you completed? _____

49-54. What is your approximate family income in a year? _____

55-56. How many people are supported on this income? _____

THANK YOU FOR YOUR HELP WITH OUR SURVEY !

Do not write in this space	
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Great Lakes Survey

Survey B

Answers and References

DIRECTIONS: **Circle the number of the best answer** for each of the following.

1. The Great Lake that produces more fish for human food than all the other Great Lakes combined is
   1. Ontario.
   *2. Erie.
   3. Huron.
   4. Michigan.

The Great Lakes: An Environmental Atlas. 1987. p. 29.

2. Deposits of which resources have been found under Lake Erie?
   *1. natural gas and salt
   2. coal and cobalt
   3. oil and magnesium
   4. iron ore and copper

The Great Lake Erie. 1987. p.13.

3. The organization established in 1909 by the Boundary Waters Treaty to oversee U.S. and Canadian use of the Great Lakes was
   1. The Great Lakes Commission.
   *2. The International Joint Commission.
   3. The Council on the Great Lakes.
   4. Great Lakes United.

The Great Lake Erie. 1987. p.142.

4. When a lot of nutrients flow into the Great Lakes there is an increase in
   1. fish catches.
   2. water temperatures.
   *3. algae blooms.
   4. chemicals in the soils.

The Great Lake Erie. 1987. p. 127. C.14.

5. The best way to prepare Great Lakes fish to reduce contaminants in them is to
   1. pan fry them in their own fat.
   *2. cut away fat, then broil on a rack.
   3. freeze before cleaning and cooking.
   4. rinse in salt water before cleaning.

Great Lakes Notebook. A Fish Eater's Guide to the Great Lakes. Great Lakes Basin Commission. 1979.

6. Some Lake Erie fish have become endangered because
   1. there are too many predator fish eating them.
   2. there is too little food for them to eat.
   *3. their spawning grounds have been destroyed.
   4. fishing laws do not protect them.

Ohio's Endangered Fishes. Ohio Department of Natural Resources. 1985. (poster).

7. DDT was banned in the U.S. in 1971, but it is still a problem in the Great Lakes because it
   1. is dissolved in the lake water.
   2. does not break down at all.
   *3. is carried by wind from other countries.
   4. is still heavily used in the U.S.

The Great Lakes Primer. Pollution Probe. 1986. p. 21.

8. The main products shipped on the Great Lakes today are
   1. manufactured goods such as cars.
   2. fresh and processed foods.
   3. lumber and stone for building.
   *4. iron ore, grain, and coal.

The Great Lakes: An Environmental Atlas. 1987. p. 20.

9. The most common use of the shoreline along the Great Lakes is
   1. commercial.
   *2. residential.
   3. agricultural.
   4. recreational.

The Great Lakes: An Environmental Atlas. 1987. p.18.

10. Most proposed diversions of water from the Great Lakes would cause water levels to
    1. increase a lot.
    2. decrease a lot.
    3. increase a little.
    *4. decrease a little.

The Great Lake Erie. 1987. p. 99.

11. The major source of phosphorus in the Great Lakes is
    *1. agricultural runoff.
    2. industrial waste.
    3. laundry detergents.
    4. mining waste.

The Great Lake Erie. 1987. p. 132.

12. The "ecosystem approach" to Great Lakes management
    1. emphasizes the biological aspects of the ecosystem.
    2. emphasizes the physical and chemical aspects of the ecosystem.
    3. focuses on the human impacts on the ecosystem.
    *4. integrates human, physical, biological, and chemical aspects of the ecosystem.

The Great Lakes: An Environmental Atlas. 1987. p.40.

Do not write in this space

1 _____
2 _____
3 _____
4 _____
5 _____
6 _____
7 _____
8 _____
9 _____
10 _____
11 _____
12 _____

There are no correct answers to the remaining items.
For each of the following statements, please circle the appropriate choice.

	strongly agree	agree	undecided no opinion	disagree	strongly disagree	Do not write in this space
13. The value of Lake Erie to Ohio residents can be measured simply by its dollar value.	1	2	3	4	(5)	13
14. I would be willing to give up some kinds of foods or household items, even if it were inconvenient and would cost more, if it would produce less pollution.	(1)	2	3	4	5	14
15. Lake Erie wetlands and marshes should be filled in to make more land for homes.	1	2	3	4	(5)	15
16. The Great Lakes are so vast that pollution by individuals has practically no effect on them.	1	2	3	4	(5)	16
17. Ohio is doing its part to protect the Great Lakes.	1	(2)	3	4	5	17
18. Toxic chemicals going into the Great Lakes should be cleaned up, regardless of the cost.	(1)	2	3	4	5	18
19. Most of Lake Erie's environmental problems have been exaggerated.	1	2	3	4	(5)	19
20. We could solve Lake Erie's problems by enforcing the anti-pollution laws we have.	1	2	3	4	(5)	20
21. Lake Erie is very polluted and ugly.	1	2	3	(4)	5	21

When people talk about the following Great Lakes topics, do you know what they mean?

Circle for each term			Do not write in this space
22. eutrophication	yes	no	22
23. fish advisory	yes	no	23
24. ecosystem approach	yes	no	24
25. pesticide	yes	no	25
26. estuary	yes	no	26
27. nutrient	yes	no	27
28. toxic	yes	no	28
29. phosphate (phosphorus)	yes	no	29
30. lake level regulation	yes	no	30
31. ecosystem	yes	no	31
32. diversion	yes	no	32
33. remedial action plans	yes	no	33
34. erosion	yes	no	34
35. dioxin	yes	no	35
			36

36. Where do you get most of your information about the Great Lakes?
Circle one.
1. television
2. newspapers
3. magazines
4. lake and lakeshore activities
5. museums and nature centers
6. other (write in) _____

Are you a member of any of the following?
Circle all those that apply.
37. boating club
38. civic or community group
39. environmental interest group
40. sport fishing club
41. none of the above

42. Sex **Circle one.** Female Male

43-44. Age (Number of years) _____

Do not write in this space
37
38
39
40
41
42
43

45-46. How many years have you lived in the Cleveland area? **Write 0 if you do not live in the Cleveland area.** _____

47-48. How many years of school have you completed? _____

49-54. What is your approximate family income in a year? _____

55-56. How many people are supported on this income? _____

THANK YOU FOR YOUR HELP WITH OUR SURVEY !

Do not write in this space
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Form B
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Great Lakes Survey

Survey C

Answers and References

DIRECTIONS: **Circle the number of the best answer** for each of the following.

1. The Great Lake that produces more fish for human food than all the other Great Lakes combined is
   1. Ontario.
   * 2. Erie.
   3. Huron.
   4. Michigan.

The Great Lakes: An Environmental Atlas. 1987. p. 29.

2. Sea lampreys have been a problem in the Great Lakes because they
   1. eat young yellow perch and eggs.
   2. use up food needed by other fish.
   3. destroy water plants near the shore.
   * 4. are parasites on trout and other fish.

The Enduring Great Lakes. 1979. p. 40.

3. Eutrophication means
   1. poisoning by chemicals.
   2. competition between animals.
   * 3. the aging of a body of water.
   4. invasion of new fish species.

The Great Lake Erie. 1987. p. 127. C. 14.

4. Several nuclear power plants have been built near the Great Lakes because
   1. their fuel can be brought in by ship.
   * 2. water is used to cool the reactors.
   3. water provides an extra power source.
   4. their fuel is mined under the lakes.

The Great Lake Erie. 1987. p. 80.

5. A major reason for trying to protect estuaries is that they
   1. contain high concentrations of metal ores.
   2. serve as testing grounds for pollution control.
   * 3. serve as breeding grounds for fish and wildlife.
   4. provide excellent deep water harbors.

The Great Lakes: An Environmental Atlas. 1987. p. 11.

6. This chemical nutrient is closely watched on the Great Lakes because it causes algae blooms:
   1. sodium
   * 2. phosphorus
   3. potassium
   4. calcium

The Great Lake Erie. 1987. p. 129. C. 14.

7. Water-based recreation and tourism in the Great Lakes basin is worth about
   1. $4 to $6 million per year.
   2. $20 to $25 million per year.
   3. $1 to $3 billion per year.
   * 4. $8 to $12 billion per year.

Impact of the Great Lakes on the Region's Economy. Center for the Great Lakes. 1984. p. 8.

8. What percent of North America's fresh surface water do the Great Lakes hold?
   * 1. 95%
   2. 55%
   3. 35%
   4. 20%

Great Lakes Primer. Pollution Probe. 1986. p. 4.

9. The most significant cause of shoreline erosion on the Great Lakes is
   * 1. wave action.
   2. wind action.
   3. groundwater seepage.
   4. surface runoff.

Great Lakes Notebook. Coastal Hazards. Great Lakes Basin Commission. 1979.

10. The most serious of the environmental problems listed below that dredging of shipping channels may cause is
    1. lowering water levels in the lakes.
    2. increasing algae growth.
    * 3. stirring toxic wastes into the water.
    4. increasing water temperatures.

The Great Lake Erie. 1987. p. 89. C. 11.

11. Which fish from Lake Erie does the Ohio Department of Natural Resources warn people not to eat?
    1. walleye
    2. yellow perch
    * 3. carp
    4. white bass

"The Clean up Effort." Chemical and Engineering News. February, 1988. p. 38.

12. The "ecosystem approach" to Great Lakes management
    1. emphasizes the biological aspects of the ecosystem.
    2. emphasizes the physical and chemical aspects of the ecosystem.
    3. focuses on the human impacts on the ecosystem.
    * 4. integrates human, physical, biological, and chemical aspects of the ecosystem.

The Great Lakes: An Environmental Atlas. 1987. p. 40.

Do not write in this space

1 _____
2 _____
3 _____
4 _____
5 _____
6 _____
7 _____
8 _____
9 _____
10 _____
11 _____
12 _____

There are no correct answers to the remaining items.
For each of the following statements, please <u>circle the appropriate choice.</u>

	strongly agree	agree	undecided no opinion	disagree	strongly disagree	Do not write in this space
13. Some unusual or delicate areas of Lake Erie shoreline should be off limits to development.	(1)	2	3	4	5	13
14. Management of the Great Lakes should be left up to professionals and scientists without citizen involvement.	1	2	3	4	(5)	14
15. Natural gas under Lake Erie should not be tapped if it would cause environmental harm.	(1)	2	3	4	5	15
16. Agriculture pollutes Lake Erie as much as industry does.	(1)	2	3	4	5	16
17. The most serious of Lake Erie's problems have been solved.	1	2	3	4	(5)	17
18. Air pollution is a serious problem in the Great Lakes.	(1)	2	3	4	5	18
19. Environmental problems are worse in the Great Lakes than in the rest of the country.	1	2	3	4	(5)	19
20. Environmental problems are not related to social, political, or economic problems.	1	2	3	4	(5)	20
21. Lake Erie is very polluted and ugly.	1	2	3	(4)	5	21

When people talk about the following Great Lakes topics, do you know what they mean?

<u>Circle for each term</u>	yes or no		Do not write in this space
22. <u>eutrophication</u>	yes	no	22
23. <u>fish advisory</u>	yes	no	23
24. <u>ecosystem approach</u>	yes	no	24
25. <u>pesticide</u>	yes	no	25
26. <u>estuary</u>	yes	no	26
27. <u>nutrient</u>	yes	no	27
28. <u>toxic</u>	yes	no	28
29. <u>phosphate (phosphorus)</u>	yes	no	29
30. <u>lake level regulation</u>	yes	no	30
31. <u>ecosystem</u>	yes	no	31
32. <u>diversion</u>	yes	no	32
33. <u>remedial action plans</u>	yes	no	33
34. <u>erosion</u>	yes	no	34
35. <u>dioxin</u>	yes	no	35

36. Where do you get most of your information about the Great Lakes?
<u>Circle one.</u>
1. television
2. newspapers
3. magazines
4. lake and lakeshore activities
5. museums and nature centers
6. other (write in) _____

Do not write in this space: 36

Are you a member of any of the following?
<u>Circle all those that apply.</u>
37. boating club
38. civic or community group
39. environmental interest group
40. sport fishing club
41. none of the above

Do not write in this space: 37 38 39 40 41

42. Sex <u>Circle one.</u> Female Male — 42

43-44. Age (Number of years) _____ — 43 44

45-46. How many years have you lived in the Cleveland area? <u>Write 0 if you do not live in the Cleveland area.</u> _____ — 45 46

47-48. How many years of school have you completed? _____ — 47 48

49-54. What is your approximate family income in a year? _____ — 49 50 51 52 53 54

55-56. How many people are supported on this income? _____ — 55 56

Form C

#

Site ____

Coder ____

THANK YOU FOR YOUR HELP WITH OUR SURVEY !

Appendix D
Questions Broadcast by WJW-TV8

Great Lakes Survey

These questions were broadcast by WJW-TV8 on the following days:

Monday, May 22

A1, B1,C1.
The Great Lake that produces more fish for human food than all the other Great Lakes combined is
1. Ontario.
2. Erie.
3. Huron.
4. Michigan.

A10. The Great Lakes fishery has an estimated economic value of about
1. $100 thousand per year.
2. $1 million per year.
3. $100 million per year.
4. $1 billion per year.

Tuesday, May 23

A11. The most likely cause of seasonal changes in lake levels is
1. diversions of water.
2. regulation of the lake.
3. agricultural water use.
4. precipitation.

A9. A major "industry" of several of the Great Lakes states and Ontario that results from the influence of the lakes on climate is
1. producing electricity.
2. raising fruit crops.
3. sport fishing.
4. shipping.

Wednesday, May 24

C11. Which fish from Lake Erie does the Ohio Department of Natural Resources warn people not to eat?
1. walleye
2. yellow perch
3. carp
4. white bass

7. Water-based recreation and tourism in the Great Lakes basin is worth about
1. $4 to $6 million per year.
2. $20 to $25 million per year.
3. $1 to $3 billion per year.
4. $8 to $12 billion per year.

Thursday, May 25

C9. The most significant cause of shoreline erosion on the Great Lakes is
1. wave action.
2. wind action.
3. groundwater seepage.
4. surface runoff.

B9. The most common use of the shoreline along the Great Lakes is
1. commercial.
2. residential.
3. agricultural.
4. recreational.

Friday, May 26

B8. The main products shipped on the Great Lakes today are
1. manufactured goods such as cars.
2. fresh and processed foods.
3. lumber and stone for building.
4. iron ore, grain, and coal.

B2. Deposits of which resources have been found under Lake Erie?
1. natural gas and salt
2. coal and cobalt
3. oil and magnesium
4. iron ore and copper

Appendix E
Great Lakes Survey Library Instructions,
O.S.U.- TV8 Great Lakes References,
Background Letter to Libraries,
Questionnaire Cover Letter,
and Library Questionnaire

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THE OHIO STATE UNIVERSITY

The Great Lakes Survey
Library Instructions

WWW TV8

Thank you for your help in providing this experience for the people of Cleveland! Your assistance will make possible some new educational efforts among those interested in the welfare of our Great Lakes.

Here's what you should have to begin the testing period:

Dick Goddard's Lake Erie Guide and Game
Fact Sheet: The Lake Next Door
The Great Lakes Survey

What to do with the materials:

We hope you can construct a sign identifying a place in the library where people can go for the Survey. Library patrons will probably ask about the game first, and a copy of it can be posted. To get their own copy, plus a fact sheet, patrons must first complete BOTH SIDES of a Great Lakes Survey. Please keep the games behind a counter so that your visitors must come to a desk with a completed survey in order to get the game and fact sheet.

Timeline for the program:

May 20 -- All materials received by the libraries; posters in libraries announcing the survey location and how to get the Dick Goddard game and fact sheet.

May 22 -- TV8 begins asking survey questions on weather reports at noon, 6 pm and 11 pm. Viewers will be invited to come to the library to take the whole survey and then get a copy of the game and fact sheet.

May 26 -- Last of the televised questions and invitations to the library from TV8. At closing time, collect the completed survey forms and mail them to OSU in the padded envelope marked WEEK 1. Mark the envelope with the name of your library branch.

May 30-June 3 -- Second week of testing. Return completed forms and any unused games, fact sheets and surveys to your main library for pick-up. There is an envelope for WEEK 2 surveys, but you do not need to mail it. It will be picked up with the rest.

If you have questions, please call Rosanne Fortner in Columbus. Work phone is (614) 292-2265.

We are looking forward to an exciting two weeks, and we couldn't do it without you. Thanks again for your help!

O.S.U. - TV8 Great Lakes References
May, 1989

Tales of the Great Lakes. Seacaucus, NJ: Castle, 198c.

1987 Report on Great Lakes Water Quality. Great Lakes Water Quality Board, November 1987.

The Great Lakes Water Quality Agreement. National Research Council of the United States and the Royal Society of Canada; National Academy Press; Washington, D.C.: 1985.

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Burns, Noel M. 1985. **Erie, the Lake that Survived.** Rowman and Allanheld, NJ. *977.12 B937e* Berea, Bedford, Brook Park, Fairview Park Regional, Maple Heights Regional, Mayfield Regional, Middleburg Heights, Parma Regional, Parma Heights, Parma-Snow, Solon, South Euclid-Lyndhurst & Strongsville Branches

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Caldwell, Lynton K. (editor). 1988. **Perspectives on Ecosystem Management for the Great Lakes.** State University of New York Press, Ithaca, NY.

Carter, Charles H., William J. Neal, William S. Haras, and Orrin H. Pilkey, Jr. 1987. **Living with the Lake Erie Shore.** Duke University Press. *333.917097712 L761* Bay Village, Beachwood, Bedford, Chagrin Falls, Fairview Park Regional, Garfield Heights, Maple Heights Regional, Middleburg Heights, North Olmsted, North Royalton, Parma Regional, Parma Heights, Parma-Snow, Solon, Strongsville and South Euclid-Lyndhurst Branches

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Gilman, Carolyn. 1982. **Where Two Worlds Meet the Great Lakes Fur Trade.** Minnesota Historical Society.

Herdendorf, Charles E. 1987. **The Ecology of the Coastal Marshes of Western Lake Erie: A Community Profile.** U.S. Fish and Wildlife Services Biol. Rep. 85 (7.9). 177 pp.

Mitchell, Mark K. and William B. Stapp. 1986. **Field Manual for Water Quality Monitoring: An Environmental Education Program for Schools.** Thomson-Shore Printers Dexter, MI.

Muir, Tom and Anne Sudan. 1987. **Toxic Chemicals in the Great Lakes Basin Ecosystem: Some Observations.** Environment Canada.

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Ripley, Paula (ed). 1984. **The Great Lakes Directory of Natural Resource Agencies and Organizations.** The Center for the Great Lakes.

Rousmaniere, John (ed). 1979. **The Enduring Great Lakes.** The American Museum of Natural History. *574.52632 En25* Bay Village, Beachwood, Brook Park, Fairview Park Regional, Maple Heights Regional, Mayfield Regional, North Royalton, Parma Heights, Parma-Snow, Solon and South Euclid-Lyndhurst Branches

Sweeney, J. Gray. 1983. **Great Lakes Marine Painting of the Nineteenth Century.** The Muskegon Museum of Art.

Taylor, Donna. 1980. **The Great Lakes Region in Children's Books.** Green Oak Press, Brighton, MI. *016.977 G798* Headquarters - RF, Mayfield Regional and Parma Regional Branches

Vine, Ira and John Zatylny. 1980. **A Guide to the Great Lakes Water Use Map.** Environment Canada.

May 23, 1989

To: Libraries participating in the Great Lakes Survey

From: Rosanne W. Fortner

Re: Background and progress of the project

It has come to our attention that some of the libraries participating in the Great Lakes Survey, in cooperation with OSU and TV8, are unaware of the background of the project and the libraries' vital role in it. We have developed the following for your information:

Using Television to Enhance Public Information Levels about the Great Lakes

For many decades the mass media have had a significant role in the development of public opinion about Lake Erie and the Great Lakes. Mass media can determine which issues the public is thinking about and create situations in which people will seek further information about a topic. This project is designed to enhance the knowledge of a television audience by creating a "need to know" among viewers as they answer televised questions about the Great Lakes. As a result, the public will receive important information about the issues currently affecting the Great Lakes. The project will also provide baseline information about adults' knowledge of Great Lakes issues. In addition, the project will reinforce the public service function of television and involve libraries, emphasizing their critical role in public education.

A survey of public knowledge about Great Lakes issues was developed, emphasizing the magnitude of the resource and the extent of environmental problems. Issues identified and survey questions developed were reviewed by a panel of Great Lakes and science education experts. The survey was given in several shopping centers in the Cleveland area on April 15. Channel 8 in Cleveland is now broadcasting items from the survey in a question/answer format on the weather portion of the daily news, May 21-25, 1989. Results of the first survey provide baseline knowledge and will be broadcast by the television station so viewers can compare their answers to the shopping center sample. The station will also air short video segments illustrating the question topics. Collection of additional public responses will be accomplished through a survey form distributed at Cleveland and Cuyahoga County libraries. Since this survey will contain some of the questions whose answers were given on television, people who watched the broadcast should be able to correctly answer these questions, thus providing a measure of the news show's educational impact.

People will be encouraged to learn more about the Great Lakes through a family style board game and Great Lakes fact sheets distributed to all those who submit survey answer forms. A follow-up sample of participants will be contacted in open-ended telephone interviews to determine how well the televised survey served its function of generating interest in learning about the Great Lakes.

This research is supported by The George Gund Foundation, WJWT-TV8, the Cleveland and the Cuyahoga County Libraries, and The Ohio State University. Results will be used to structure public information and education programs about the Great Lakes.

Thank you for your participation in this public education effort!

To Cuyahoga County and City of Cleveland Libraries:

Thank you all for your assistance in administering the Great Lakes Survey and in distributing the Dick Goddard Lake Erie Game and The Lake Next Door Fact Sheet! We are receiving a good number of week 1 surveys in the mail and encourage you to return the rest of the the surveys, games, and fact sheets to your main library or to our office, if you have not already done so.

Enclosed please find a brief, one page questionnaire concerning the survey administration process. We would appreciate your taking a few minutes to fill it out and let us know how the survey process worked at your library and any comments or reactions you have to your participation in the project. We hope you found it educational and worthwhile for your patrons.

Thanks again for your help in educating about the Great Lakes!

Library Name_____

When did your library receive
Copies of the survey?_____
Copies of the Lake Erie Game?_____
Copies of the Lake Erie Fact Sheet?_____

Did your library have all three items available when people came to take the survey?_____

Were all three items (survey,game,fact sheet) given to each person?_____

Were games and fact sheets given only to those people who had completed a survey?____
_____

Did some people answer more than one form (A,B, or C) of the survey?
If so, why?_____
How common was this?_____

Were there many people who requested a copy of the survey but did not return a completed survey? Please indicate an approximate percent_____

Were the directions provided for administering and returning the surveys clear?____
_____

Please describe any problems encountered in administering the survey or distributing the game or fact sheet._____
_____
_____

Please share any comments made by or reactions of people who took the survey.._____
_____
_____
_____

Have you seen any increase in the level of use of library reference materials concerning the Great Lakes or an increase in requests for such information? If so, please describe.
_____
_____

Do you feel your library's participation in this project was worthwhile?_____
_____

Do you have any other comments or suggestions concerning this project?_____
_____
_____

Appendix F
The Lake Next Door Fact Sheet and
Dick Goddard's Lake Erie Guide and Game

The Lake Next Door

A brief look at how things are going in the Great Lake Erie, with information from the Ohio Sea Grant College Program and the Ohio Coastal Resource Management Program.

What's so great about Lake Erie?

* It produces more fish for human food than all the other Great Lakes put together (16 million pounds in 1988)!
* It has deposits of oil and natural gas beneath it – Canada extracts some gas, but Ohio doesn't because of possible environmental damage.
* Fishing in the Great Lakes provides about $1 billion a year for the region's economy!
* The Great Lakes contain 95% of the fresh surface water in North America– that's 5,500 cubic miles!
* The Great Lakes provide drinking water for more than 11 million people, including 2.5 million Ohioans!
* If you spread the water of the Great Lakes evenly over the continental U.S. it would be about 9 feet deep!
* Water-based recreation and tourism in the Great Lakes region has an annual economic value of $8-12 billion!
* According to ODNR there are 12 nesting pairs of bald eagles along Ohio's Lake Erie shore in 1989! (In 1979 there were only four!)
* Lake Erie's marshes are used by almost all of the economically important animal species of the region at some point in their lives, yet marshes are disappearing quickly as they are dredged and filled for more homes and recreation facilities!
* About 1/5 of the U.S. population and 1/4 of Canada's population live in the Great Lakes basin!
* Lake effect weather encourages growth of 9,000 tons of grapes per year in Ohio's Lake Erie vineyards!
* It costs more than twice as much–in dollars and in energy– to send a ton of goods by truck than by boat from Duluth to Buffalo! Iron ore, grain, and coal are the main products shipped.

Was Lake Erie dead?

Well-meaning people in the 1970s claimed that the Lake was dead or at least dying. That impression came from the visible conditions: some dead fish on shore, lots of algae washing up and creating odors, beaches that were unfit for swimming. Things didn't look very lively!

Lake Erie, however, was never dead. In fact its problems came from too much life! When farm fertilizers ran off into the Lake, the Lake was fertilized too. The sewage from cities near the Lake had lots of phosphate in it from detergents, and that is also a fertilizer. So the plants in the Lake responded just like plants on the land -- they grew and grew. Eventually they overdid it, and the great algae die-offs changed the ecology of the Lake. As the algae died, the decay process used up all the oxygen in some parts of the Lake. The fish we liked to catch moved out to better waters, or died, or failed to reproduce. There weren't many reasons to come to the Lake for fun.

Scientists call the aging process of a lake *eutrophication*. It happens naturally over a long period of time when lakes fill in around the edges and eventually turn back into land. We aged Lake Erie faster than normal by over-fertilizing it with our addition of phosphorus.

Have we fixed the problem?

Not entirely, but Ohio has now joined the list of the other Great Lakes states that have reduced the phosphate in detergents and removed phosphate during sewage treatment. We are also changing farming practices so that less fertilizer goes into the Lake. The walleye is back in record numbers, and the Lake is a great place for recreation again! This is a remarkable success story, but we must constantly be alert to ways that our activities on land may be affecting Lake Erie.

WNET TV8 CLEVELAND

What about Toxic Chemicals in Lake Erie?

Toxic means poisonous. According to reports by the International Joint Commission (IJC), there are over 300 chemicals in the Great Lakes that could be poisonous to people.

The chemicals enter the lake by leaking out of old landfills, by spills, by burning sewage sludge and garbage, by the wind blowing from other areas, and sometimes by illegal dumping. Many of the products we use each day were manufactured in ways that produced toxic chemicals as well as the things we really wanted.

Fortunately, people usually don't encounter these chemicals in large amounts. Treatment of drinking water removes some contaminants, and the only Lake Erie fish that accumulate enough of the chemicals to be dangerous are catfish and carp that find their food right at the bottom of the Lake. That's where the chemicals are the most concentrated.

Sometimes we do see how the poisons affect lake animals, though. Some of the worst toxics are those that are long-lived, and aren't eliminated from animal bodies. As the animal grows, it gets more toxins from the things it eats. When it is eaten by another animal, that animal gets a big dose, which it in turn builds up for the next eater in the food chain. If enough poison is present, the animal will die. It may only show a sign of the problem, however. Shore birds like terns and cormorants may hatch with deformed beaks. Bullheads, a kind of catfish, may have tumors around their mouths and in their livers. Their poor health tells us that the health of the Lake and its inhabitants is in danger.

There are some active groups in Ohio that can give you advice about toxics and other Lake Erie issues: Ohio Sea Grant (c/o David Green, 1575 Lowell St., Elyria, OH 44035 or Frank Lichtkoppler, 99 E. Erie St., Painesville, OH 44077) and Ohio EPA (1800 Watermark Dr., Columbus, Ohio 43215) have free fact sheets on toxic chemicals. Sea Grant recommends that you clean fish carefully to remove any fat that may have toxics in it. Broil the fish on a rack so that the fat drips off of it.

From Ohio EPA obtain a list of household chemicals that are toxics, and dispose of them in a safe way. If we stop using some of the toxic chemicals, fewer of them will go into Lake Erie. There are safe products that can be used instead of most of the toxic ones.

What is a RAP?

A *Remedial Action Plan (RAP)* is a plan developed by a community to deal with a serious Great Lakes contamination source. For Lake Erie there are 11 such sources, called *Areas of Concern* by the IJC. They include the Maumee, Black, Ashtabula, and Cuyahoga Rivers in Ohio.

They have been selected for remedial (fix-it) action because some of the Lake's water in these areas has been especially damaged. We need to do some planning to find ways to fix the problem and to make sure that it doesn't happen again. All interested people can be part of this planning process. We are all part of the problem, and we can all be part of its solution! If you live in an affected area, contact the Governor's Lake Erie office to find out how you can be involved (614-265-6395 in Columbus, or in Cleveland 216-622-3240).

The Ecosystem Approach

There is a saying that in the universe "everything is connected to everything else." What we do at home, in our cities and on the farm, in our grocery stores and in our governments can all affect the health of Lake Erie and the rest of our environment. The governments in the Great Lakes basin (two countries, eight states, one province and countless local governments) and the IJC are working on Lake issues with what is called an *ecosystem approach*. It considers all the human, physical, biological, and chemical aspects of the Great Lakes system put together.

Since all the parts are connected in many ways, we must connect our positive forces and work together to protect the Lakes. It is not enough to repair the damage that has already been done. We must prevent future damage to the Lakes by removing the basic causes of the problems. We need to change our use of energy, chemicals, and natural resources, and we need people like you to see the environment as a personal responsibility.

Produced by the Ohio State University School of Natural Resources and College of Education with support by The George Gund Foundation and WJW-TV8, Cleveland, Ohio. Project Directors: Dr. Roseanne Fortner and Dr. Victor J. Meyer, 089 Ramseyer Hall, 29 W. Woodruff Ave., Columbus, Ohio 43210. © 1989 The Ohio State University Research Foundation

Dick Goddard's Lake Erie Guide & Game

THE OHIO STATE UNIVERSITY

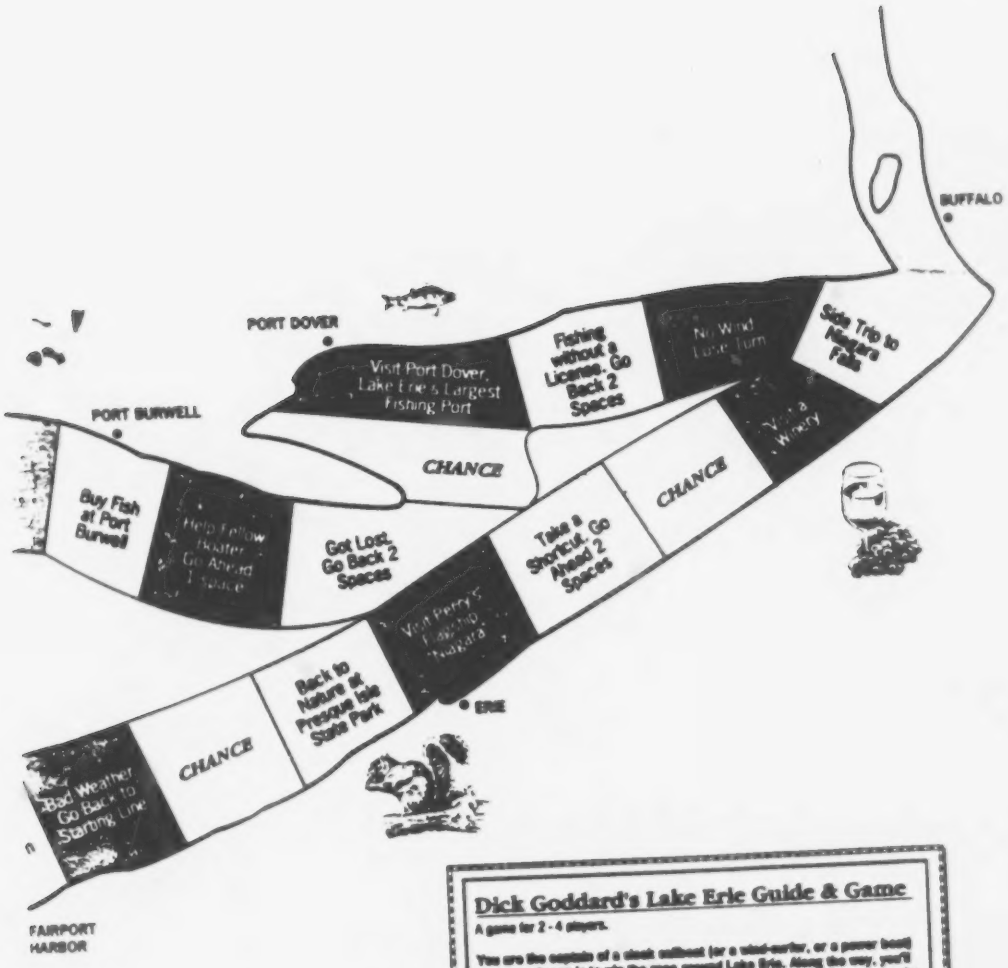
WUAV TV8 CLEVELAND

A game for 2-4 players.

Designed to remind Lake Erie area residents
and visitors of the importance of our Great Lake.

Created by The Ohio State University
with the support of The George Gund Foundation
and the Cleveland and the Cuyahoga County Public Libraries.

Dick Goddard's Lake Erie Guide & Game
CHANCE
(PLACE CARDS HERE)
PORT STANLEY
LAKE ST. CLAIR
DETROIT
PONDEAU HARBOR
Lost Map. Go Back 2 spaces
CHANCE
Picnic at Pondeau Harbor
Stop to Birdwatch
LAKE ERI
PORT PELEE
CHANCE
Visit Leamington, the Tomato Capital
Starting Line
Finish Line
Visit the Toledo Zoo
Stop to Swim
Island Sightseeing
TOLEDO
Water Skiing in Sandusky Bay
Overcaught Walleye Limit. Go Back 4 Spaces
CHANCE
Fair Wind's Flip Again
Eat Lunch in the Flats
Watch Wildlife at Monitor Marsh
SANDUSKY
VERMILION
Home of the TVB Woolyboar Festival each autumn


BUFFALO
PORT DOVER
Visit Port Dover, Lake Erie's Largest Fishing Port
Fishing without a License. Go Back 2 Spaces
No Wind! Lose Turn
Side Trip to Niagara Falls
PORT BURWELL
CHANCE
Visit a Winery
Buy Fish at Port Burwell
Help Fellow Boater Go Ahead 1 Space
Got Lost. Go Back 2 Spaces
Take a Shortcut. Go Ahead 2 Spaces
CHANCE
Visit Perry's Flagship Niagara
ERIE
Back to Nature at Presque Isle State Park
CHANCE
Bad Weather Go Back to Starting Line
FAIRPORT HARBOR

Dick Goddard's Lake Erie Guide & Game

A game for 2 - 4 players.

You are the captain of a sleek sailboat (or a wind-surfer, or a power boat) and your dream is to win the race around Lake Erie. Along the way, you'll experience the weather, enjoy the recreation and see the sights that make Erie a Great Lake.

DIRECTIONS

1. To start: Take turns flipping a coin. The first person to get "heads" goes first.
2. To play: Take turns flipping the coin. If you flip "heads," move ahead one space; if you flip "tails," move ahead two spaces. Follow the directions on the space where you land.
3. Chance cards: If you land on "Chance," have the person to the left of you pick the top "Chance" card and read the question. If you answer correctly, move ahead two spaces. If you answer incorrectly, stay where you are.
4. To win: The first boat around the lake to cross the finish line wins. (You must land exactly on the space marked "Finish Line."

Dorsal fins are found on a fish s

a) underside
b) back
c) sides

Ans. (b) back

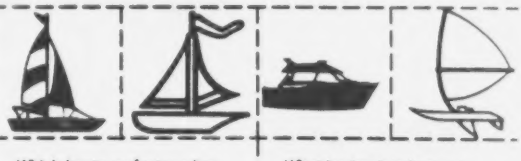
What type of shoreline material resists erosion best?

a) sand
b) soil
c) clay
d) rock

Ans. (d) rock

Cut out the cards and shuffle them. Stack the cards, question side down, near the game board and select the top card when you land on a "chance" space.

Cut out the boats and use as markers as you move around the board.



Longshore currents are caused by

a) wind blowing
b) river water
c) tides

Ans. (a) wind blowing

True or False.

Cities near large bodies of water are likely to be warmer in the winter and cooler in the summer.

Ans. True

Which heats up faster when the sun is shining?

a) water covered by ice
b) water
c) land

Ans. (c) land

What bedrock is known to preserve fossils the best?

a) slate
b) limestone
c) granite

Ans. (b) limestone

Who had control of the Great Lakes during the Revolutionary War?

Ans. the British

How were the Great Lakes formed?

Ans. Glaciers scoured out the rocks and melted to fill the basins.

The first white men to see the Great Lakes were

a) Pilgrims
b) buffalo hunters
c) French Voyageurs

Ans. (c) French Voyageurs

What group of people first utilized the Great Lakes waterways for transportation?

Ans. Indians

Which waterway connects the Great Lakes to the Atlantic Ocean?

Ans. St. Lawrence River and Seaway

What river runs between Lake Erie and Lake Ontario?

Ans. Niagara

How many states border the Great Lakes?

Ans. Eight (Can you name them?)

True or False.

Lake Erie is the southernmost lake in the Great Lakes system.

Ans. True

What lake lies between Lake Huron and Lake Erie?

a) Lake St. Clair
b) Lake St. Mary's
c) Lake Ontario

Ans. (a) Lake St. Clair

The water in the middle of Lake Erie is

a) International waters
b) Canadian
c) Canadian and American

Ans. (c) Canadian and American

Acid rain presents the greatest dangers to fish populations during which season?

Ans. spring

When an oil spill occurs in U.S. waters, who's supposed to pay for clean-up costs?

a) the spiller
b) the taxpayers
c) the Coast Guard
d) Federal Government

Ans. (a) the spiller

What toxic chemical led to the "walleye" scare of the 1970's? a) mercury b) lead c) sulfur Ans. (a) mercury	Landowners along the shoreline of Lake Erie own the land out to the a) waterline b) middle of the lake c) cliff edge Ans. (a) waterline	People are most likely to be exposed to toxic substances in the Great Lakes by a) drinking water b) eating certain fish c) swimming Ans. (b) eating certain fish	Which sport fish attracts the greatest number of fishers to Lake Erie? Ans. walleye
The most common use of the shoreline along the Great Lakes is a) commercial b) recreational c) residential Ans. (c) residential	Name the five Great Lakes. Ans. Superior, Huron, Michigan, Erie and Ontario	True or False. Lake Erie provides more fish for human consumption than all the other Great Lakes put together. Ans. True	Which city on the Great Lakes is the center of the U.S. auto industry? Ans. Detroit
True or False. Canada takes oil and gas from under Lake Erie, but the United States does not. Ans. True	What is the name of the canal built to bypass Niagara Falls? Ans. Welland Canal	What percentage of the world's fresh surface water is found in the Great Lakes? a) 10% b) 20% c) 50% Ans. (b) 20%	Name the large tourist attraction that is the outlet for Lake Erie. Ans. Niagara Falls
True or False. Lake Erie is the shallowest of all the Great Lakes. Ans. True	What is Lake Erie's largest island? Ans. Pelee	What Great Lakes regional Indian confederacy was known as the "Five Nations?" a) Shawnee b) Iroquois c) Huron Ans. (b) Iroquois	Complete Commodore Oliver Hazard Perry's quote from the Battle of Lake Erie: "We have met the enemy and. . ." Ans. "...they are ours
In what part of the lake was the Battle of Lake Erie fought in the War of 1812? Ans. Put-in-Bay	What parasitic fish was partially responsible for the decline of the lake trout? a) alewife b) sea lamprey c) walleye Ans. (b) sea lamprey	What is the most common duck found in the Great Lakes area? Ans. mallard	True or False. Lake Erie is the coldest of the Great Lakes. Ans. False

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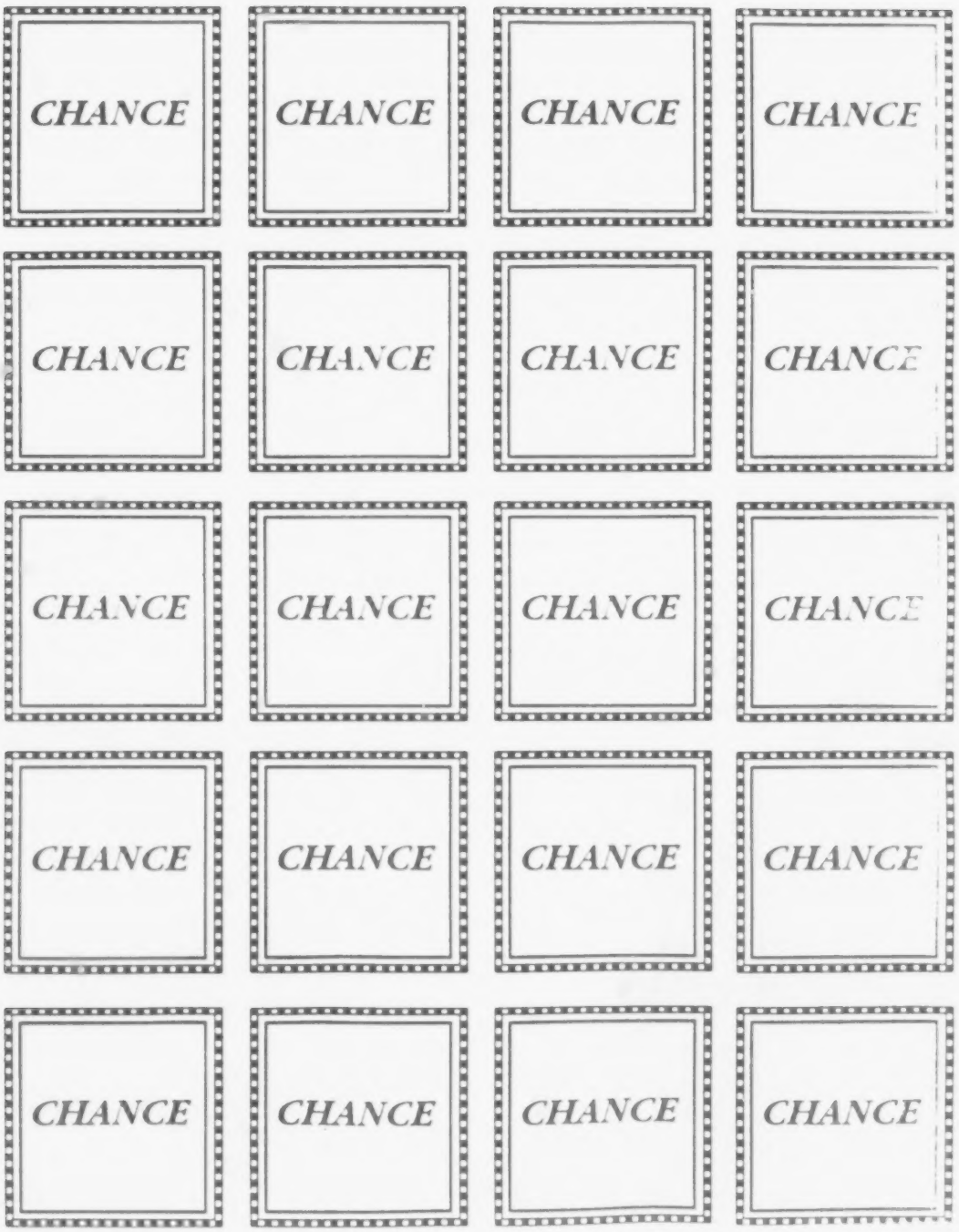
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About the Great Lake Erie. . .

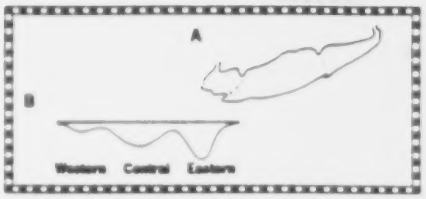
This game will take you to places around the shores of Lake Erie and introduce some interesting areas you may actually want to visit. Sites listed in the game are repeated below with ideas of things to do and see in each area. Smooth sailing!

The Lake Erie Basins

Lake Erie is divided into three basins, as Diagram A shows.

They get deeper from west to east (Diagram B).

Here are some interesting areas in each basin.
Find them on the game board and visit them in person!



Western Basin

Detroit, MI: Most populated area in the Lake Erie region; many marinas and yacht clubs; year-round pro sports and cultural events; Greenfield Village and Henry Ford Museum nearby.
Toledo, OH: Largest port on Lake Erie, with cargo shipping of grain, coal, iron ore and others; sand dunes at Oak Openings Metropark; world famous zoo; historic Fort Meigs and Miami-Erie Canal.
Lake Erie Islands: Divide the Western from the Central Basin. West Sister Island has Ohio's only Wilderness Area. Four islands (South Bass, Middle Bass, Kelleys and Pelee) can be reached by ferry from the mainland. Islands have wineries, caves, glacial formations, 19th century mansions, campgrounds, harbors, and a variety of birds and other wildlife. Gibraltar Island, in Put-in-Bay, houses Ohio State University's Stone Lab field station.
Sandusky, OH: Cedar Point amusement park; lakeside resorts, wineries and natural areas; large coal shipping port; many water-related recreational opportunities and areas for hunting and camping.
Catawba Island and Marblehead: Oldest operating lighthouse on the Great Lakes; Lakeside resort; East Harbor and Catawba State Parks; important sport fishing/boating site.

Central Basin

Port Stanley, Ont.: Resort town with fine beaches, quiet countryside, spacious campgrounds, and good sites for fishing and boating.
Vermilion, OH: Rich natural history, Great Lakes Historical Society's Museum and HarborTown 1873; large fleets of pleasure craft; home of the annual TV8 Woollybear Festival.
Lorain, OH: Large industrialized port; boat facilities; historic homes and lighthouse; harbor at mouth of Black River.
Cleveland, OH: Large metropolitan area; port active in shipping and industry, regattas and speedboat races; concentration of art, science, history and educational facilities; professional sports teams; many natural areas with active nature programs, varied habitat and diverse wildlife.
Ashtabula, OH: Coal and iron transport; recreational boating, fishing and swimming; historical shipping and railroad sites.

Eastern Basin

Niagara Falls: Scenic falls, tourist attractions, historic sites, hiking.
Buffalo, NY: Industrial city, commercial shipping port, professional sports, historical sites and museums; access to Erie and Black Root Canals.
Erie, PA: Large protected port, recreational boating, swimming, fishing; winter sports; historic 19th century structures.
Port Dover, Ont.: Erie's largest commercial fishing port, harbor for fishing boats and pleasure craft, resort area.
Port Colborne, Ont.: Welland Canal's entrance to Lake Erie; lock system between Lakes Erie and Ontario; sand beaches, marinas, sport fishing and marine museum.

Cleveland's Own.
NEWSCENTER 8

Appendix G
Results on Knowledge Items, Responses to Opinion Statements, and Summary of Library and Mall Results

THE OHIO STATE UNIVERSITY

Results on Knowledge Items
Survey A

Numbers indicate percent of respondents selecting each response. Library responses are given first; mail percentages follow the slash. Correct response are marked with *.

1. The Great Lake that produces more fish for human food than all the other Great Lakes combined is
   1. Ontario. 6.9/15.3
   * 2. Erie. 78.1/54.1
   3. Huron. 4.4/10.9
   4. Michigan. 10.6/19.7

2. The cheapest way of transporting iron ore from Duluth, MN, to Buffalo, NY, is by
   1. truck. 3.1/5.4
   2. train. 5.6/15.8
   3. airplane. .6/3.3
   * 4. boat. 90.7/75.5

3. Most of the toxic chemicals in Lake Superior and half of those in Lake Michigan get there from
   1. sewage treatment plants. 6.2/13.6
   2. farm runoff. 19.1/10.3
   * 3. air pollution. 8.6/10.3
   4. industrial wastes. 66.0

4. In the last 15 years, the amount of phosphorus in the Great Lakes has
   1. increased a little. 20.6/42.1
   2. remained about the same. 8.1/18.4
   3. been reduced a little. 33.1/25.7
   * 4. been reduced a lot. 38.1/15.8

5. Managing the Great Lakes is difficult because there
   1. are no international treaties. 7.5/12.7
   2. is little scientific research. 6.2/9.4
   * 3. are many levels of government involved. 59.6/49.2
   4. are few water pollution laws. 26.7/28.7

6. Which is the greatest consumptive use of Great Lakes water?
   * 1. Municipal 33.3/29.3
   2. Manufacturing 25.9/37.0
   3. Power production 44.4/25.0
   4. Agricultural 7.4/8.7

7. The most likely way people are exposed to hazardous chemicals in the Great Lakes is from
   1. drinking water. 49.1/41.5
   2. swimming. 13.8/14.8
   * 3. eating fish. 15.7/36.6
   4. eating produce. 21.4/7.1

8. Marshes along the Great Lakes have been disappearing rapidly because
   * 1. people have drained and fill them. 49.1/42.1
   2. much less rain has been entering them. 13.8/16.6
   3. high lake levels have flooded the marshes. 15.7/17.1
   4. marsh water has drained out to the lakes. 21.4/24.3

9. A major "industry" of several of the Great Lakes states and Ontario that results from the influence of the lakes on climate is
   1. producing electricity. 17.3/26.6
   * 2. raising fruit crops. 45.1/16.4
   3. sport fishing. 16.0/21.5
   4. shipping. 21.6/35.6

10. The Great Lakes fishery has an estimated economic value of about
   1. $100 thousand per year. 5.0/7.3
   2. $1 million per year. 16.1/38.0
   3. $100 million per year. 26.7/41.3
   * 4. $1 billion per year. 52.2/13.4

11. The most likely cause of seasonal changes in lake levels is
   1. diversions of water. 8.7/17.6
   2. regulation of the lake. 5.0/12.6
   3. agricultural water use. 7.5/10.4
   * 4. precipitation. 78.7/59.3

12. The "ecosystem approach" to Great Lakes management
   1. emphasizes the biological aspects of the ecosystem. 5.2/7.3
   2. emphasizes the physical and chemical aspects of the ecosystem. 5.9/19.2
   3. focuses on the human impacts on the ecosystem. 15.7/17.5
   * 4. integrates human, physical, biological, and chemical aspects of the ecosystem. 73.2/55.9

Library
Mean score=6.31
sd=2.07
N=163
% 8 or more correct=30.1
Mean words=9.56
sd=3.20
Mean opinion=4.10
sd=.46

Mail
Mean score= 4.55
sd=2.04
N=186
% 8 or more correct=7.5
Mean words=8.07
sd=3.96
Mean opinion=3.91
sd=.53

Responses to Opinion Statements Survey A. Numbers indicate percent of respondents selecting each response. Library responses are given first; mail percentages follow the slash.

	strongly agree	agree	undecided no opinion	disagree	strongly disagree	mean
13. A new factory that will create jobs should be built even if it will harm the environment.	2/3	8/5	7/13	39/40	44/40	4.2/4.1
14. We shouldn't worry about environmental problems in the Great Lakes because technology will solve them all soon.	1/1	3/4	4/7	40/36	52/53	4.4/4.4
15. Government should be doing more to control pollution in Lake Erie.	44/55	44/29	6/8	3/4	3/6	1.8/1.8
16. If other parts of the United States need water, we should send them Great Lakes water.	1/4	9/15	13/30	27/27	51/24	4.2/3.5
17. People who own shoreline property should have the right to do what they want with it.	8/6	18/11	14/22	38/43	24/19	3.5/3.6
18. More sections of Lake Erie shoreline should be set aside as parks for people's enjoyment.	41/40	42/39	7/11	9/8	1/2	1.9/1.9
19. Measures should be taken to prevent the extinction of endangered species in Lake Erie.	51/58	44/29	3/7	2/3	1/3	1.6/1.6
20. People should be allowed to take as many fish as they want from Lake Erie.	1/4	6/10	6/15	52/45	36/27	4.2/3.8
21. Lake Erie is very polluted and ugly.	4/8	10/19	16/19	48/43	23/12	3.8/3.3

THE OHIO STATE UNIVERSITY

Results on Knowledge Items
Survey B

Numbers indicate percent of respondents selecting each response. Library responses are given first; mail percentages follow the slash. Correct response are marked with *.

WWTV8

1. The Great Lake that produces more fish for human food than all the other Great Lakes combined is
   1. Ontario. 12.8/17.9
   * 2. Erie. 69.6/42.9
   3. Huron. 2.0/12.5
   4. Michigan. 15.5/28.6

2. Deposits of which resources have been found under Lake Erie?
   * 1. natural gas and salt 91.7/68.7
   2. coal and cobalt 1.4/10.8
   3. oil and magnesium 4.1/8.6
   4. iron ore and copper 2.8/11.9

3. The organization established in 1909 by the Boundary Waters Treaty to oversee U.S. and Canadian use of the Great Lakes was
   1. The Great Lakes Commission. 28.2/43.1
   * 2. The International Joint Commission. 43.0/19.3
   3. The Council on the Great Lakes. 23.9/26.0
   4. Great Lakes United. 4.9/11.8

4. When a lot of nutrients flow into the Great Lakes there is an increase in
   1. fish catches. 17.9/19.7
   2. water temperatures. 5.5/8.5
   *3. algae blooms. 69.0/54.8
   4. chemicals in the soils. 7.6/17.0

5. The best way to prepare Great Lakes fish to reduce contaminants in them is to
   1. pan fry them in their own fat. 7.5/5.5
   * 2. cut away fat, then broil on a rack. 44.2/44.2
   3. freeze before cleaning and cooking. 6.8/13.3
   4. rinse in salt water before cleaning. 41.5/37.0

6. Some Lake Erie fish have become endangered because
   1. there are too many predator fish eating them. 4.9/3.7
   2. there is too little food for them to eat. 10.4/14.4
   *3. their spawning grounds have been destroyed. 63.9/60.4
   4. fishing laws do not protect them. 20.8/21.4

7. DDT was banned in the U.S. in 1971, but it is still a problem in the Great Lakes because it
   1. is dissolved in the lake water. 18.4/20.0
   2. does not break down at all. 58.2/54.1
   *3. is carried by wind from other countries. 9.2/11.4
   4. is still heavily used in the U.S. 14.2/14.6

8. The main products shipped on the Great Lakes today are
   1. manufactured goods such as cars. 1.4/9.1
   2. fresh and processed foods. 4.7/4.8
   3. lumber and stone for building. 1.4/5.4
   4. iron ore, grain, and coal. 92.6/80.6

9. The most common use of the shoreline along the Great Lakes is
   1. commercial. 20.9/36.2
   * 2. residential. 35.8/26.1
   3. agricultural. 8.8/11.7
   4. recreational. 34.5/26.1

10. Most proposed diversions of water from the Great Lakes would cause water levels to
    1. increase a lot. 4.1/10.5
    2. decrease a lot. 54.1/42.5
    3. increase a little. 4.1/12.7
    * 4. decrease a little. 37.8/3[illegible]

11. The major source of phosph[illegible] the Great Lakes is
    * 1. agricultural runoff. 23.4/16.5
    2. industrial waste. 26.2/45.6
    3. laundry detergents. 44.1/29.1
    4. mining waste. 6.2/8.8

12. The "ecosystem approach" to Great Lakes management
    1. emphasizes the biological aspects of the ecosystem. 10.9/7.7
    2. emphasizes the physical and chemical aspects of the ecosystem. 10.1/16.4
    3. focuses on the human impacts on the ecosystem. 13.0/13.1
    * 4. integrates human, physical, biological, and chemical aspects of the ecosystem. 65.9/62.8

Library
Mean score=6.25
sd=1.89
N=150
% 8 or more correct=24.6
Mean words=9.20
sd=3.29
Mean opinion=3.74
sd=.46

Mail
Mean score=5.05
sd=2.14
N=191
% 8 or more correct=17.0
Mean words=7.80
sd=3.82
Mean opinion=3.62
sd=.58

Responses to Opinion Statements Survey B. Numbers indicate percent of respondents selecting each response. Library responses are given first; mail percentages follow the slash.

	strongly agree	agree	undecided no opinion	disagree	strongly disagree	mean
13. The value of Lake Erie to Ohio residents can be measured simply by its dollar value.	5/7	17/15	10/19	41/30	28/30	3.7/3.6
14. I would be willing to give up some kinds of foods or household items, even if it were inconvenient and would cost more, if it would produce less pollution.	35/36	56/43	7/9	1/7	1/5	1.8/2.0
15. Lake Erie wetlands and marshes should be filled in to make more land for homes.	1/5	3/7	7/12	34/32	55/45	4.4/4.1
16. The Great Lakes are so vast that pollution by individuals has practically no effect on them.	5/6	0/7	4/6	40/31	51/50	4.3/4.1
17. Ohio is doing its part to protect the Great Lakes.	6/6	32/18	26/36	26/31	10/12	3.0/3.3
18. Toxic chemicals going into the Great Lakes should be cleaned up, regardless of the cost.	44/53	44/31	8/9	2/2	1/6	1.7/1.8
19. Most of Lake Erie's environmental problems have been exaggerated.	5/2	10/10	15/19	48/44	23/25	3.8/3.8
20. We could solve Lake Erie's problems by enforcing the anti-pollution laws we have.	17/16	46/39	18/27	16/14	3/3	2.4/2.5
21. Lake Erie is very polluted and ugly.	5/11	13/17	10/19	58/43	15/10	3.6/3.3

THE OHIO STATE UNIVERSITY

Results on Knowledge Items

Survey C

Numbers indicate percent of respondents selecting each response. Library responses are given first; mail percentages follow the slash. Correct response are marked with *.

1. The Great Lake that produces more fish for human food than all the other Great Lakes combined is
   1. Ontario. 8.2/16.7
   * 2. Erie. 64.6/50.5
   3. Huron. 3.4/9.7
   4. Michigan. 23.8/23.1

2. Sea lampreys have been a problem in the Great Lakes because they
   1. eat young yellow perch and eggs. 16.1/13.1
   2. use up food needed by other fish. 16.8/19.7
   3. destroy water plants near the shore. 13.3/14.8
   * 4. are parasites on trout and other fish. 53.8/52.5

3. Eutrophication means
   1. poisoning by chemicals. 36.4/34.9
   2. competition between animals. 3.9/5.3
   * 3. the aging of a body of water. 50.4/45.0
   4. invasion of new fish species. 9.3/14.8

4. Several nuclear power plants have been built near the Great Lakes because
   1. their fuel can be brought in by ship. 2.1/8.1
   * 2. water is used to cool the reactors. 76.0/60.8
   3. water provides an extra power source. 19.9/26.9
   4. their fuel is mined under the lakes. 2.1/4.3

5. A major reason for trying to protect estuaries is that they
   1. contain high concentrations of metal ores. 3.5/2.8
   2. serve as testing grounds for pollution control. 8.3/14.1
   * 3. serve as breeding grounds for fish and wildlife. 80.6/76.3
   4. provide excellent deep water harbors. 7.6/6.8

6. This chemical nutrient is closely watched on the Great Lakes because it causes algae blooms:
   1. sodium 9.2/12.4
   * 2. phosphorus 77.5/69.1
   3. potassium 9.9/14.0
   4. calcium 3.5/4.5

7. Water based recreation and tourism in the Great Lakes basin is worth about
   1. $4 to $6 million per year. 11.8/14.9
   2. $20 to $25 million per year. 22.2/37.6
   3. $1 to $3 billion per year. 44.3/27.1
   * 4. $8 to $12 billion per year. 41.7/20.4

8. What percent of North America's fresh surface water do the Great Lakes hold?
   1. 95% 55.1/37.8
   2. 55% 32.7/40.5
   3. 35% 8.2/15.1
   * 4. 20% 4.1/6.5

9. The most significant cause of shoreline erosion on the Great Lakes is
   * 1. wave action. 80.8/55.9
   2. wind action. 8.2/13.4
   3. groundwater seepage. 2.7/13.4
   4. surface runoff. 8.2/17.2

10. The most serious of the environmental problems listed below that dredging of shipping channels may cause is
    1. lowering water levels in the lakes. 27.6/27.0
    2. increasing algae growth. 6.2/10.8
    * 3. stirring toxic wastes into the water. 64.1/56.2
    4. increasing water temperatures. 2.1/5.9

11. Which fish from Lake Erie does the Ohio Department of Natural Resources warn people not to eat?
    1. walleye 3.4/13.3
    2. yellow perch 6.9/11.7
    * 3. carp 86.9/67.2
    4. white bass 2.8/7.8

12. The "ecosystem approach" to Great Lakes management
    1. emphasizes the biological aspects of the ecosystem. 14.5/7.4
    2. emphasizes the physical and chemical aspects of the ecosystem. 15.9/16.5
    3. focuses on the human impacts on the ecosystem. 12.3/18.8
    * 4. integrates human, physical, biological, and chemical aspects of the ecosystem. 57.2/57.4

Library
Mean score=7.64
sd=2.17
N=148
% 8 or more correct=56.7
Mean words=8.69
sd=3.11
Mean opinion=3.79
sd=.41

Mail
Mean score=6.08
sd=2.3
N=193
% 8 or more correct=21.2
Mean words=7.83
sd=3.99
Mean opinion=3.68
sd=.44

Responses to Opinion Statements Survey C. Numbers indicate percent of respondents selecting each response. Library responses are given first; mail percentages follow the slash.

	strongly agree	agree	undecided no opinion	disagree	strongly disagree	mean
13. Some unusual or delicate areas of Lake Erie shoreline should be off limits to development.	59/56	33/33	4/5	0/3	3/3	1.5/1.7
14. Management of the Great Lakes should be left up to professionals and scientists without citizen involvement.	8/11	14/9	14/13	40/43	23/24	3.6/3.6
15. Natural gas under Lake Erie should not be tapped if it would cause environmental harm.	38/40	39/34	17/12	6/8	1/6	1.9/2.1
16. Agriculture pollutes Lake Erie as much as industry does.	9/17	38/27	26/29	22/18	6/9	2.8/2.8
17. The most serious of Lake Erie's problems have been solved.	1/4	13/8	18/14	50/47	18/27	3.7/3.9
18. Air pollution is a serious problem in the Great Lakes.	17/26	60/44	15/15	8/12	1/4	2.2/2.2
19. Environmental problems are worse in the Great Lakes than in the rest of the country.	3/8	10/15	27/24	55/44	5/9	3.5/3.3
20. Environmental problems are not related to social, political, or economic problems.	2/10	8/8	12/7	48/39	37/36	4.0/3.8
21. Lake Erie is very polluted and ugly.	2/14	10/17	12/12	54/47	22/11	3.8/3.2

Summary Library and Mail Results —— Knowledge, Opinion, Words, and Demographics

Summary Library Results (Combined weeks, sites, forms)
Mean total knowledge score=6.72/12 sd=2.14 N=461
% 8 or more correct=36.9
Mean words=9.16/14 sd=3.22
Mean opinion=3.89/5 sd=.47
% watching broadcast=52.5
Week 1 respondents N=261 Week 2 respondents N=197
City respondents N=142 County respondents N=319
Form A N=163 Form B N=150 Form C N=148
Mean broadcast=2.67 sd=.98 Mean nonbroadcast=2.02 sd=.85

Summary Mail Results (Combined sites and forms)
Mean total knowledge score=5.24/12 sd=2.27 N=570
% 8 or more correct=17.0
Mean words=7.90/14 sd=3.92
Mean opinion=3.74/5 sd=.53
Randall Park respondents N=279 Arcade respondents N=291
Form A N=186 Form B N=191 Form C N=193
Mean broadcast=1.79 sd=1.04 Mean nonbroadcast=1.72 sd=.88

Numbers indicate percent of respondents selecting each response.
Library responses are given first; mail percentages follow the slash.
Mean number of words known=9.2/7.9

When people talk about the following Great Lakes topics, do you know what they mean?

Circle for each term	yes	no
22. eutrophication	15/13	85/88
23. fish advisory	73/65	27/35
24. ecosystem approach	45/46	55/54
25. pesticide	96/89	4/11
26. estuary	56/40	44/60
27. nutrient	89/87	11/13
28. toxic	95/92	5/8
29. phosphate (phosphorus)	84/80	16/20
30. lake level regulation	75/71	25/30
31. ecosystem	53/55	47/45
32. diversion	69/61	31/39
33. remedial action plans	51/48	49/52
34. erosion	95/87	5/13
35. dioxin	59/50	42/50

Numbers indicate percent of respondents selecting each response. Means are given for age, years lived in Cleveland, years of school completed, family income, family size, number of organizations belonged to, and number of times respondent viewed the broadcast. Library responses are given first; mail percentages and means follow the slash.

36. Where do you get most of your information about the Great Lakes?
Circle one.
1. television 44.0/55.4
2. newspapers 28.1/25.2
3. magazines 5.9/5.4
4. lake and lakeshore activities 8.4/4.1
5. museums and nature centers 6.7/2.5
6. other (write in) 6.9/7.4

Are you a member of any of the following?
Circle all those that apply.
37. boating club 5.0/5.3
38. civic or community group 10.2/8.6
39. environmental interest group 5.6/6.5
40. sport fishing club 4.8/4.4
41. none of the above 71.1/64.0

42. Sex **Circle one.** Female Male
51.9/44.3 48.1/55.7

43-44. Age (Number of years). 50.2/33.4

45-46. How many years have you lived in the Cleveland area? **Write 0 if you do not live in the Cleveland area.**
41.7/21.0

47-48. How many years of school have you completed? 13.5/13.5

49-54. What is your approximate family income in a year? 31843/38100

55-56. How many people are supported on this income? 2.6/2.6

Mean number of organizations belonged to=2.6/2.5
Mean number of times viewing the broadcast (Library only)=1.82

END

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